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THE GAS JOURNAL

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A Glance at the Contents—

Block System of Gas Charges.

An interesting scale of charges, to take effect from to-morrow, is announced by the Truro Gas Company.

Humidity Control in Dry Purification.

Mr. N. S. Logan, of the Philadelphia Electric Company, gives his experiences on humidity control in dry purification at West Conshohocken.

Fixing Gas Appliances.

At their last meeting the members of the Wales and Monmouthshire Junior Gas Association had a paper by Mr. R. T. Mills, of Cardiff, on "Experiences in Fixing Gas Appliances."

Obituary.

The deaths are recorded of Lord Melchett, who was President of the Society of British Gas Industries in 1925-26, and of Mr. Alexander Waddell, late Gas Engineer and Manager at Dunfermline.

Corrosion of Pipes.

In our Correspondence Columns is a letter from Mr. S. B. Coles, in which he calls attention to experimental work which has been carried out in Germany on "Denso," the anti-corrosion pipe bandage.

Obtaining Records of Retort Spalling.

Valuable photographs, sent to us by Mr. Ronald A. Weston, of the Hull Station of the British Gas Light Company, Ltd., are reproduced. They relate to plaster casts taken in 1928, and will be of interest to those studying the behaviour of refractory materials in vertical retorts.

Waterless Gasholders.

A lecture of great interest on the subject of waterless gasholders was given before the members of the Yorkshire Junior Gas Association by Mr. L. Hartley, a Director of Messrs. Clayton, Son, & Co., Ltd., gas constructional engineers, of Leeds. The author dealt with the assembly of the "M.A.N." holder.

The "Dri-Gas" Plant at St. Andrews.

Thirty members of the Scottish Junior Gas Association (Eastern District) visited the works of the St. Andrews Gas Company on Saturday, Dec. 6. Particular attention was paid to the "Dri-Gas" plant which has recently been installed, and Mr. A. Morris explained the various points, afterwards reading a short paper dealing with the plant, and pointing out some of the particular advantages obtained since its installation.

Heating Carbonizing Plant with Coal Gas.

An abstract translation is given of a paper on the operating and economic aspects of heating inclined chamber ovens with coal gas, by H. Muller and Herr Stief ("Das Gas- und Wasserfach," Dec. 13). Conditions prevailing in the works with which the paper deals were rather abnormal in that the carbonizing plant was apparently much larger than it need have been. Consequently some of the financial details are not universally applicable.

Coking a Banded Bituminous Coal.

As a result a series of experiments, Mr. C. P. Finn states that different samples of clarain, which forms the largest percentage of the banded ingredients of a coking slack, may vary considerably in their coking properties, but yield a comparatively poor coke that is much fissured and which breaks easily. Although it has not yet proved possible to show the effect of vitrain by definite blending experiments, the evidence available suggests that it is proportionately more valuable than clarain in a coking slack. Durain, although so different in its coking properties from vitrain and clarain, appears to exert little effect when present in a coking slack. Fusain, though itself non-coking, has been shown to be valuable when uniformly admixed with the remainder of the coking slack and when present to an extent not exceeding about 5 p.ct.

New Year's Greetings to All.

"GAS JOURNAL" REVIEW

1930.

ERE this issue of the "JOURNAL" comes into the hands of the gas industry throughout the length and breadth of the land, one more year will have passed into history; and what is there that can be said of it in its passing? Little enough that is pleasant. Roughly speaking, there are to-day in this country twice as many unemployed as was the case twelve months ago; and while the figure—terrible enough at the beginning of the year—has been doubling, the country has been governed by those whose claim to office is that they represent Labour.

It is true that things have been extraordinarily difficult; never, perhaps, have they been more so. Fresh problems constantly face us; problems to the solution of which nothing that has gone before affords much in the nature of a clue. Never was there a time when legislation by precedent was likely to be more dangerous; new methods are required to meet unprecedented situations. Judging by all the symptoms, these new methods of ridding the country of its ailments, or at any rate of relieving its distress, can hardly be devised without a good, sound knowledge of economics; and we should feel happy in the certain assurance that, wherever needed, this knowledge is possessed to the extent necessary for its successful application. In saying this, we have in mind a recently published remark to the effect that "the future of the country is to a great extent in the hands of the trade union leaders."

For the repetition of past follies there is now the less excuse inasmuch as there is plenty of informed opinion to serve as a guide. The necessity is paramount for producing British goods at prices which will render them attractive to buyers the world over; and this can only be accomplished by due regard to economic facts. There was a few days ago in "The Times" a striking letter by Mr. Walter Runciman—so striking, and yet so simple, a statement of conditions as they must appear to many, that opportunity may be taken to reproduce some sentences here: "Another comical wave of fictitious forecasts is floating about, that improvement in trade is observed in the offing. That amounts to nothing more than vague balderdash. A revival of trade does not come back by the same methods that have destroyed it. The colossal crime of overloading the commercial life of the country with obligations it cannot stand has sinned against the law that governs finance. This can only be stopped and remedied by reversing the policy that has imperilled, and continues to imperil, our financial stability. . . . The task of undoing the mischief which has sunk so deeply for long years into our national life by unsound, ill-informed, slovenly administrative judgment will call for men of pre-eminent skill and courage. It may not be, in competent hands, entirely insoluble. The Labour Party are not the original authors of the *débâcle*. It was there gaping at them when they took office."

All that can be done at the moment is to express the earnest hope that 1931 may witness a serious start on the road to better things. That road is not paved with smoothly rounded phrases, but with the hard taskmaster, economy. Of words there have already been enough and to spare in this country. At the best they can do nothing to extricate us from our difficulties; at the worst they can lull us into a false sense of security in the face of peril. This is what the New York Correspondent of "The Times Trade and Engineering Supplement" has to say about smooth words: "'Sunshine talk'—immoderate and unseasonable attempts to force the public into a mood of optimism unjustified by the facts of the economic situation—is exacting a heavy toll from American business. It is now evident to almost everybody, what was plain before only to people with some imagination, that stimulants used at the wrong time leave the patient worse off in the end than he was in the beginning. And there has been much misuse of such stimulants in the United States this year."

Salvation lies only in action—action in the direction of lightening the burdens of industry, rather than of increasing them. May it be possible a year hence to record that action of this nature has been taken! For ourselves we have no doubt that the Old Country will win through. On this score, we are in no way pessimistic.

Of Particular Concern to Us.

IN so much as considerations to which reference has just been made apply to the country generally, so must they bear upon our own particular industry in one way or another. Considering it apart, however, the gas industry has enjoyed a year not only satisfactory in itself, but full of promise for the future. In succeeding notes events are commented on as they relate to special branches; but we would take the opportunity here and now of emphasizing the significance of the position occupied by the Gas Industry in the Stock Markets. At the end of a year outstanding in disaster to the general investor, the holder of gas stocks can congratulate himself upon emerging unscathed, and in many instances with something on the right side. Investors clearly have no thought of making the shroud which the Gas Industry, if some of the remarks of electrical friends were taken seriously, would seem shortly to require. The working results set forth in the new issue of the "Journal Calendar and Directory" amply justify this optimistic feeling on the part of investors; for they reveal an industry ever pressing forward to new records. An industry, too, which by patient and persistent effort, is gradually securing some of that public attention that it so thoroughly deserves. At Leeds and Berlin in June, at Hull and Bridlington in October, its work and its aspirations were broadcast.

Looking round for points to bear in mind, it is found that rationalization by way of amalgamation has become so general that a scheme for providing compensation for loss of employment thereby has received the approval of the National Joint Industrial Council for the Gas Industry. Again, London County Council statistics of ambulance calls point to the significant fact that the most dangerous hour of the day for London pedestrians is between 10 p.m. and 11 p.m. This may be considered side by side with the fact that photographs of magnificent installations of street gas lighting have appeared in our pages on various occasions throughout the year. Then we have the fact that a good deal has been heard about what has been termed by certain influential members of the House of Commons "a new and impudent form of dictatorship that is exercised by certain municipal authorities over their tenants." These are points that should not be lost sight of.

And now, what of ourselves? We, like others, have done our "bit" in the good cause, and we may perhaps be pardoned brief reference to one of our outstanding contributions to the year's achievements—the issue in January of the "Gas Salesman" as a publication entirely independent of the "JOURNAL." This step has met with the appreciation that we confidently looked for, and from our

own point of view it has been a great advantage in enabling us to render fuller service to the vitally important selling side of the industry.

The Industry and Legislation.

THE passage of another year finds the Gas Industry still straining at the legislative leash which alone prevents its entry into the extended sphere of useful service which, by common consent, lies before it. The persistent representations of the National Gas Council, with the whole weight of the industry behind it, and the strong recommendations of independent Committees formed of men selected by the Government for their skill and experience, are sympathetically received, but are none the less firmly set aside, on the ground that the business of Parliament is so congested as to make the introduction and passage of remedial legislation impossible.

Is it surprising, therefore, that a feeling at once of exasperation and of despair should be spreading rapidly among those responsible for gas supply in this country, all of whom are satisfied that their claims are not only reasonable, but, if granted, will enable them to play a not inconsiderable part in helping the industries of this country out of the desperate straits in which so many find themselves? Is it surprising that this feeling should have extended to the workers in the industry, whose fortunes are so intimately bound up with its success, and of whom so many are co-partners and profit sharers in the undertakings which they serve? Nor can there be many in the industry who find balm for their disappointment in the welter of legislation, actual and projected, which is the alleged reason for delay.

The immediate effect of the Coal Mines Act, to which many weeks of parliamentary time have been devoted during the past twelve months, was to bring the Coal Mining Industry to the very brink of a precipice. Disaster has happily been averted, for the time at least, but the menacing potentialities of the Act in regard to the Public Utility Services, and to gas in particular, remain. A year ago we referred to a pronouncement by the President of the Board of Trade to the effect that those services were obtaining their coal at an uneconomic price, and we ventured to point out in reply that coal for gas making was bought in the open market in the ordinary way. The official view has, however, duly found expression in the Act, and though the machinery for the protection of consumers has been strengthened through the efforts of the National Gas Council, it is not sufficiently adequate to allay misgivings as to the results which will flow from the introduction of this uncalled for and harmful form of protection.

In violent contrast to the Coal Mines Act is the action of the Government in declining to renew the safeguarding duties imposed for the benefit of the lace trade—action which has dealt a serious blow to an industry struggling to keep its head above water. Some of our readers may be pronounced believers in free trade, others may be equally strongly in favour of some measure of protection, but none of them can approve a course of action which on the one hand affords protection to an industry by taxing the home consumer, and on the other removes protection from another industry by freeing the foreign supplier from taxation.

This is neither the time nor the place to examine the other matters which have led to the congested state of parliamentary business, and caused the exclusion of useful industrial legislation; but we may pertinently ask how many of them have done anything to relieve the state of depression which threatens to ruin many of the industries of this country, or, save by the creation of further armies of officials, to relieve unemployment. It is true that since the leaders of the Trade Union movement within the industry have joined with the employers' side in urging upon the Government the necessity for a comprehensive revision of Gas Legislation there has been some stirring of the dry bones, but long and bitter experience shows that the appointment of a Committee, which we believe is to be the outcome of the representations thus made, may be no more than a device for securing further postponement.

National Work.

FORTUNATELY, the progressive spirit which has always characterized the Gas Industry has not been impaired by the continued apathy of Parliament, and is being manifested in several directions. A very important step has been taken by creating a Joint Committee representative of the three National Bodies—the Institution of Gas Engineers, the British Commercial Gas Association, and the National Gas Council—to consider the development of large-scale gas supply for commercial and industrial purposes. Experience in the United States of America, where the increase in the industrial use of gas has in recent years been enormous, coupled with the highly successful results obtained in the same sphere by individual undertakings in this country, has led to a more complete realization of the possibilities open to the industry. Schemes of co-operation, by means of which knowledge already acquired will be put at the disposal of others, and experiment and research will be undertaken, have already been outlined, and the interest which they have aroused in the industrial districts to which they have been referred for consideration and discussion is a good augury for the future.

"Industry must have cheap gas. The greater the load on gas undertakings the lower are their overhead costs per unit of gas sold, so that if a large market can be attracted by offering cheap gas the effect is to bring down gas prices all round. The introduction of a more scientific method of charge, based not only on quantity but also on the commodity value of gas and the service given, and, if possible, also on the load factor, is vital, if an expanding market for gas is to be found." Such is the considered opinion of the Area Gas Supply Committee, and even if the powers, which they regard as vital to expansion, are not immediately obtained, the industry, feeling that they cannot much longer be denied, will continue its efforts to pave the way to their utilization when at last they are accorded.

The policy of amalgamation between gas undertakings continues to be actively pursued, and a considerable number of mergers have been carried out during the past year, while others are being negotiated. The idea so long fostered by existing legislation that gas supply is a purely parochial matter naturally dies hard, and vested interests tend to be a stumbling-block, but there is an ever-growing recognition of the fact that larger units ordinarily mean greater efficiency and greater cheapness, and that small manufacturing units faced with keen competition and difficult conditions are wiser to accept offers of absorption rather than to continue a struggle which is of little profit. The full development of this movement cannot, of course, be achieved without a cheapening and simplification of the procedure required to effect amalgamations, and here again the cry goes up, "How long?"

We referred last year to the appointment of yet another Departmental Committee on Gas Poisoning. The inquiry has duly taken place, and thanks to the efforts of the Gas Safety Committee of the National Gas Council, and to the authoritative and convincing nature of the evidence given by witnesses on their behalf, the industry has emerged with flying colours. The number of accidental deaths from coal gas poisoning was found by the Committee to show no appreciable increase, and to remain at a figure which, in their opinion, gives no cause for alarm, while they attribute the increased number of gas suicides in large measure to a change in the suicidal means adopted. Extravagant suggestions as to changes in the composition of gas, or as to the addition to it of irritant or other substances, were discarded, and no new obligations which they are not anxious in the interests of the public to fulfil have been laid on gas undertakings.

Another matter of importance, which has been the subject of inquiry by a Government Committee during the year, is the disposal of trade effluent. Valuable evidence regarding the technical and legal aspects of a question which, in the case of some gas undertakings, is acute, was given on behalf of the industry, and there is reason to hope that the recommendations of the Committee will eventually result in the making of satisfactory working arrangements.

Obviously, we cannot mention here more than a few

of the matters of first-class importance affecting the industry which have had to be dealt with during the past year; the others, and their number and complexity have been greater than ever, have been faithfully recorded in our pages week by week, and they are amply sufficient to indicate the vital need for the continuance and intensification of united effort. In the difficult days through which the country is passing, and of which it is to be feared we have not seen the end, not only must individual units loyally support the central organizations whose help they may have to invoke at any moment, but they must in turn aid them by bringing at once to their notice anything either of local or national interest in any way affecting the industry. Any defection means loss of strength both to the individual and to the whole, and never in the history of the industry has strength been more essential than it is to-day.

Gas Production.

One can say with full justification that 1930 has brought energetic development in practically every phase of gas manufacture. This, we think, can be attributed to four things. First, the greater research work undertaken by the gas industry, directed by the Institution of Gas Engineers; secondly, the more intensive research work of the manufacturers of plant; thirdly, the more general recognition of the value of these investigations by the individual members of our industry, and better co-operation between manufacturer and user of plant; and, fourthly, a more effective platform for discussion. Regarding this final observation, there have been, in addition to the annual general meeting of the Institution in June, the autumn research meeting in November last, and also the World Power Conference in Berlin, which, from the gas point of view, represented a great advance upon the first conference held at Wembley six years ago. Some may, perhaps, have felt disappointment that nothing startling in the realm of either gas manufacture or distribution was revealed at the Berlin Conference, but the fact remains—and it is an important one—that engineers and technicians throughout the world were able to realize the vital part played by the gas and carbonizing industries in satisfactorily solving fuel problems, how efficiently gas production, distribution, and utilization are carried out by our industry, and what pains we take to study the requirements of the consumer. And the conference must have been encouraging to research workers.

It is, of course, extremely difficult in a short article to survey the developments which have taken place in a live industry with a working capital of £180,000,000, and supplying with light, heat, and power over 9 million consumers; the trouble is not what to record, but what to omit, and we crave indulgence if some of our omissions appear serious. Taking the mainspring of our industry first—plant for the carbonization or gasification of coal—there has been no startling divergence in principle, though improvements in materials of construction, in construction itself, in modification of design, and in methods of working have undoubtedly been effected, all of which are calculated to cheapen the cost of the gaseous therm. Such improvements will prolong the life of plant and reduce maintenance charges, and will allow of greater flexibility of working and hence a better return from what were formerly termed "residuals." The "Journal" has recorded the good results which have accrued from these improvements in continuous vertical, intermittent vertical, and horizontal systems of carbonization. As an indication of what has been accomplished in vertical carbonization, we have only to compare the 1930 figures for the gas output per unit of retort house area with those of a few years ago. In view of such figures, one may be apt to lose sight of the remarkable developments which have lately been effected in horizontal settings, including, for example, descension pipes, screen bar grates for producers, and the recovery of waste heat. Recently published results of waste-heat recovery in horizontals leave no doubt as to the benefits which accrue. In one instance it has been demonstrated that the saving effected by the installation of a waste-heat boiler instead of a coke-fired one amounts to over 3d. per ton of coal carbonized.

The excellent study on refractory materials, the results of which were presented at the autumn research meeting of the Institution, cannot fail to have beneficial results. It has been shown that of major importance is the problem of selecting the correct type of material for the various zones of a vertical retort. The results of the study suggest that it is reasonable to think that a special type of material could be developed to resist the flaking action better than a silica brick. The introduction of this new type over some four feet of the retort length might cut down flaking to a minimum and reduce the necessity for hot-patching of the top zones. At the moment it appears that the possible refractories which could be used for high-temperature carbonization and would resist flaking must be comparatively costly. If, however, such products increased the certainty of continued operation by 500 days, they would amply repay the extra cost. Similarly, the zonal nature of vertical retort working suggests that the constitution of a cement must vary with the zone of the retort. It is along these lines, it is suggested, that progress with gas-works refractories is likely to be made.

Heating the Settings.

The foregoing advances in carbonization have had their effect on the quality of coke produced, and attention to handling has been a marked feature of the year. Last year over 10 million tons of coke was sold in the home and industrial markets. For some years the average growth in demand has amounted to 250,000 tons annually; last year it reached 400,000 tons, thanks to fostering the load by attention to the proper preparation and grading of coke by the carbonizing industries. And in this regard we ought to record the fact that the Gas Light and Coke Company have spent over £400,000 on improved coke preparation plants during the last three years. Then the work of the Liverpool Gas Company on the production of a thoroughly satisfactory domestic fuel by high-temperature carbonization is most encouraging. Here the coke is made from blended coals and is dry-cooled. There is no doubt that the potential market for coke is enormous; and the conditions of this market can be bettered by making less breeze, by using more breeze and less large coke for heating settings, and by ensuring better prices for breeze by standardization of sizes and universal nomenclature. This matter has been dealt with recently in the "Journal," and we have not heard the last of it.

Developments in the design of step-grate producers have made it possible to use increasing percentages of breeze. In fact, one gas-works at least is employing 43 p.ct. of breeze in the producer fuel. Then there are special producers which can gasify breeze. Concerning these, a month or two ago we had a very enlightening account of the outside producers at Manchester, which have been successfully operated on practically all grades of coke breeze; a breeze containing up to 40 p.ct. passing through ¼-in. mesh having been utilized with complete satisfaction. The control of the plant, we are told, is simple, its efficiency at all loads high, and its flexibility as regards both material and output very great; the cost of manufacturing the producer gas is low, and its use for heating retort settings represents economies in the cost of carbonization. There is no question that 1930 has added greatly, in several directions, to our knowledge of outside producers, the latest information (on the plant at the Wandsworth Gas-Works) being published only a week ago.

At the autumn meeting of the Institution we gained in our knowledge of the virtues of the back-run process in the manufacture of carburetted water gas, the particular advantage being the great increase in capacity of the plant. The story is not yet finished, but we look forward to its completion by the end of next year, when it will be possible to make proper comparisons between the working of the same plant with and without the back-run process. Our understanding of the mechanism of oil cracking generally has increased as a result of the work published in 1930—an example of this being the investigation carried out at the Corrales Gas-Works of the Primitiva Gas Company.

Disposal and Recovery.

THE year has also seen a brightening in the technique of handling effluent liquors. A test of considerable duration and complete success has been made on the disposal of effluent liquors by evaporation on the bars of gas producers at Hinckley, where an evaporation has been obtained which corresponds to the disposal of 37 p.ct. of the total effluent liquor produced. Further inquiry has been made into the processes of phenol extraction by benzole washing, and we shall hear more about this method before long. What is stated to be a simple resinification process has also been brought forward and is at present under investigation. In regard to the ammonia situation, 1930 has brought no relief, though it has brought a widening of knowledge. During the year the suggestions made by Mr. Hollings and Dr. Pexton in 1929, regarding the washing of ammonia from gas and the working-up of a liquor of reasonable ammonia content, have been advantageously carried into effect by several undertakings. In this respect the results at Stretford, where Congdon standpipes are in use with the horizontal settings, are of great interest. A departure has been made at Burton-on-Trent, where part of the ammonia is being recovered as bicarbonate, by compression of the foul gas and reaction with carbonic acid. It would seem that this method would not pay if generally applied, because there would be no adequate market for the bicarbonate. One of the chief advances of the year is the appreciation that the ammonia situation can be met in one way only—active co-operation.

Benzole recovery, too, has come in for a good deal of discussion. It was dealt with at the Institution of Gas Engineers' meeting in June, and again at the World Power Conference. At the former meeting it was stated that the total cost of recovery and refining, including labour and all overhead charges, for a medium-sized gas-works recovering benzole from horizontal retort gas is about 6d. per gallon of refined benzole, which is equivalent to 6d. or 7d. per therm in the gas. The recovery of benzole from gas produced in vertical retorts is less attractive than from that produced in horizontals, but the difference in the value of therms as benzole and the price at which therms are sold to large consumers by many gas-works using verticals is still sufficiently wide to indicate that benzole recovery would be profitable on these works. We look forward to developments in recovery of benzole by the active carbon process, upon which work has been proceeding during the year.

Purification.

AN outstanding feature of 1930 has been the remarkable evidence of the efficacy of drying gas in both large and small works. Very interesting are the results, which have been published in the "JOURNAL," at an undertaking having an output of 43 million c.ft. a year. The whole situation was summed up at the Institution meeting in June, when gas drying was stated to be one of the most important advances which have been made on the technical and commercial sides of our industry in recent years. The process is, in fact, now well established. Another feature of the purification of gas has been well to the front this year—oxide purification. The working simplicity of this process is at once its justification and its disadvantage. It is so easy to say that the cost of the process is next to nothing, and to forget the large amount of capital entailed not only in the installation of the plant itself, but in the value of the space occupied by the boxes and the revivification area; moreover, in view of possible extensions to carbonizing plant, it may be difficult to assess the value of the potential space. There can be no doubt that attention to improved methods of working is amply repaid by reduced costs and also by postponement of the capital expenditure on new boxes. During the year one of the Institution Sub-Committees has been delving into the precautions taken by undertakings to avoid explosions and fires in purifiers, and have arrived at the conclusion that every proper precaution is being taken. A host of other works matters of an ancillary nature cannot be dealt with in a broad review such as this, though mention might well be made of the application of a new electrostatic process for the prevention of scale formation in boilers. This process, it was stated recently, is most effective and exceedingly economical.

Discussing progress in these columns a year ago, we remarked that "in 1929 new ideas were enthusiastically received and considered with commendable freedom from traditional bias. When we turn to low-temperature carbonization, we find the same attitude dominating the mind of the gas engineer; he is not averse to low temperatures merely because they are low." The same applies to the year 1930; but we have had a pronouncement on the low-temperature carbonization plant at the Richmond Works of the Gas Light and Coke Company. The process may now be considered as technically understood; but, as for the financial aspect, a happy ending is not yet in sight. Plants so situated as to secure good slack cheaply, and which can command a good price for the resultant solid smokeless fuel, may show a profit; but in those parts of the country at a distance from the coalfields the difference in price that has to be paid for coal and that received from the sale of coke and gas does not appear to provide a margin sufficient to meet even operating expenses. The return from the oils has proved disappointing; though development of cracking and hydrogenation processes may help the situation. Until this comes about, and the consumer of smokeless solid fuel has to pay no more for it than he does for coal, there can be little hopeful future for any low-temperature process which has as its principal aim the production of a domestic fuel.

Distribution and Lighting.

WHEN we turn to progress in the fields of distribution and utilization of gas, the first thing which impresses us is the growing popularity of the waterless holder—an item which formed the subject of discussion at Leeds in June. Little, this year, has been heard of pressure storage in this country, but much more has been heard about corrosion of pipes than in 1929, when we had occasion to remark that the subject did not receive half as much attention as its importance warrants. In addition to numerous individual contributions on the matter, we had the findings of the Corrosion of Pipes Sub-Committee of the Institution, whose report is confined to protective coatings. It would appear that the virtues of cast iron in relation to steel will have to be re-assessed. For the last twenty years the relative merits of cast iron and steel have been argued, and cast iron has largely held its own because the experience of a century has shown that it has an extraordinarily high degree of resistance to corrosion in ordinary circumstances, and because there has not been convincing proof that the wrapping of steel pipes will be permanently effective. However, there are now available coverings which, if they prove as good as they seem, may alter the relative positions of cast iron and steel. On the matter of mainlaying, the provision of ample width of footway is the most promising line for improvement in the accommodation of mains in future roads.

The most satisfactory feature of the year, we think, has been the retention and development of the lighting load of our industry. In particular the installation of centrally-suspended gas lamps in the big Borough of Lewisham is of great interest and importance, for it led to the reorganization of the gas lighting in many important centres both in London and the Provinces. We admire the justice of the Lewisham decision; both gas and electricity, under the same conditions, having equal maintenance costs and equal cost of installation, were examined by expert and unbiased opinion. There is no doubt that electricity has a name for being modern not simply because of its age in comparison with gas, but because it is thought that it can best meet modern conditions. But the conditions at Lewisham are essentially modern, with swift-moving traffic of great volume, and it has been shown that gas is better able than electricity to meet them. Local authorities want a reliable light; work in 1930 has demonstrated that they have it in gas. Motorists need an illuminant which has the greatest power of penetration, which is diffuse, and which is free from glare; they have these qualities in gas. And the pedes-

trian cries for greater safety, which means more and better light at the lowest cost; these requirements, too, are met by gas. It is gratifying to note that the Institution of Gas Engineers has considered the subject of street lighting by gas to be of such immediate importance as to justify the appointment of a special Street Lighting Sub-Committee. Throughout the year, the pages of the "JOURNAL" have testified to the great progress which has been made in the field of public lighting by gas.

Radiation and Convection.

AT the autumnal research meeting of the Institution of Gas Engineers several references were made to the virtues of convective heat, and it would appear that in the immediate future our industry will seriously consider how and to what extent they can translate the thermal energy of gas into convection. This is not a question of radiation *versus* convection. As an industry we have gained approval from the general public and the medical and nursing profession alike because we have proved beyond question that we can provide healthy radiant heat economically; and in this direction great credit is due to the research abilities and the commercial enterprise of the manufacturers of gas heating appliances, coupled with both their and our own publicity efforts. It would be folly not to encourage with full assurance and enthusiasm the radiant gas fire which performs the dual function of heating cheerfully and ventilating efficiently. We have no fear that such folly will be indulged in. The present position of the heating load has been built up by faith in the value of radiation; and it is essential that this faith should persist. At the same time we must not neglect the field of convection heating—a field which, we are sure, can be properly covered by our industry if it is tackled adequately and efficiently, particularly the latter. In the past there is no denying that we have held and suffered from very confused notions of gaseous combustion and adequate ventilation, and the bogey of carbon monoxide has dogged our footsteps and retarded development; and it is with real gratitude that we recognize that, thanks to research in 1930, the air of confusion is being transformed into an atmosphere of clarity. The whole problem of convection heating is fundamentally a delicate one which requires cautious handling; but we have no doubt that it can be handled thoroughly satisfactorily by the gas industry.

Ventilation of gas appliances has, rightly, been a subject of much investigation during 1930. In the early part of the year, in a paper, it was pointed out that one of the most significant aspects of gaseous combustion as distinct from the burning of solid fuel is that with gas appliances a baffler may be employed which renders the apparatus in essence independent of variations in chimney pull (or "push," as some would have it) and permits of relatively very high thermal efficiencies. Far from being an annoying encumbrance, a baffler is a desirable adjunct to high-efficiency gas consuming appliances; but it is essential that the baffler used should be correct in principle and in application. In this regard, there is the welcome fact that the National Gas Council this year issued a new set of instructions for fixing geysers. It is up to us to see that these instructions are carried out to the letter by all builders or outside fitters; if they are, there cannot be the slightest cause for anxiety regarding the functioning of geysers. Of course, we need hardly remind our readers of the continuous investigations on combustion carried out during the year by the Institution and the University of Leeds.

Prominent among particular developments in the use of gas for water heating has been the great success of the small and medium consumption storage heater in 1930. We have learned a good deal, too, about the fascinating method of burning gas in liquids; the application of this system to central heating appeals to us very much. Generally speaking, there appears to be a bright future for the employment of gas for central heating purposes. As to the storage heater, several undertakings have offered their consumers attractive rates for this class of appliance. Indeed, "attractive rates" have been a marked feature of the year 1930; it may be said that optional tariffs are now the order of the day. A matter closely connected with rates is the "gas unit," which has been discussed freely in our columns.

In addition to sundry other meetings, both the World Power Conference in Berlin and the meeting of the British Commercial Gas Association in October provided platforms to discuss the amazing possibilities of the use of gas in industry. At the latter meeting it was explained that in 1929 the world's largest gas undertaking increased its industrial business by 10 p.ct.—in a period of trade depression.

Such is the diversity of the industrial load, and such its complexity, that to-day it is difficult to find men who are sufficiently well trained to occupy responsible positions as industrial gas salesmen. To satisfy this need, and to cover the entire subject of gas salesmanship, the "B.C.G.A." are formulating an Education Scheme for Salesmen. Our readers are aware of the Association's recommendations for the establishment of a sound, practical Salesmen's Scheme, as a complement to that of the Institution of Gas Engineers. We hope that the Scheme will be ready for launching in the early days of the New Year. We are glad, too, to see the principle of Home Study introduced into the Salesmen's Scheme. As has been stated in these columns, we recognize the desirability of class study where that is feasible, but where it is not we believe home study to be a valuable alternative. On this question there has been a great deal of valuable correspondence in the "JOURNAL" this year.

As a final note on distribution and utilization, we ought to mention the excellent efforts which have been made to explain the virtues of gas to the public. Particularly noteworthy in this direction has been showroom enterprise—whether the showroom be static or mobile.

Coal in 1930.

THE year has been an eventful one indeed for the coal industry, which has been subjected to a welter of legislation almost beyond the dreams even of those who in all the troublous times since the war have singled out coal as specially delectable for the sport of politics. The outcome of most of this legislation is still very uncertain, and it is all far too involved to be detailed here. But it will be well to review briefly the events which have led up to the present situation, and to leave it, not too optimistically, to be solved by the real test period which is now beginning.

It will be remembered that one of the promises upon which the present Government came into office was a reduction of the working hours in the mines from eight to seven. This at the time was without economic justification, and still more so subsequently when they came to implement it, and when trade had already begun to suffer a setback which has continued ever since. So a compromise was introduced by which a seven-and-a-half-hour day was given first, with the full reduction to seven hours to follow in July, 1931.

The postponement is intended to give time for the effective working of a highly complicated set of marketing schemes which, under Act of Parliament, the coalowners in the various districts have been compelled to formulate for Board of Trade approval, failing which schemes would have been imposed upon them. On the working of these schemes much depends, and this is the test period which is just beginning.

There is a national scheme operated by a Central Council which allocates outputs to about 20 districts. These have district schemes operated by Executive Boards, which allocate outputs to individual collieries, and fix minimum prices. There are a National and also District Committees of Investigation to adjudicate upon complaints as between producer and consumer, and, in fact, enough paraphernalia to satisfy the most bureaucratically minded. Without going into further detail, it is of particular interest to the gas industry to note that, in the passage of the measure through Parliament, levies of all kinds upon one class of consumer in favour of another were eliminated. It certainly appeared to be the original intention of the promoters of the scheme to bolster up competition in export markets by making the home consumer pay more,

but though this can still be done by local agreement among the owners in any one district, compulsion cannot be brought to bear upon dissentients.

Even with these complicated arrangements framed in the hope of financing the shorter working day, its introduction has not gone without a hitch. The industry was quite incapable, in the present state of trade, of paying the same weekly wage for a reduced output, but the Miners' Federation and the Government realized this, and, with the help of their combined influence, agreement has been reached in most of the districts for temporary working, with a stoppage of one week in only one case. But sight must not be lost of the fact that these arrangements are only temporary and of short duration, and then only for the working of the seven-and-a-half-hour day, with the still greater problem of the still shorter day outstanding.

As regards the commercial side of the industry, world conditions do not appear by any means favourable to those whose hopes are based on the marketing schemes. It is estimated that the world's coal consumption has shrunk by about 10 p.ct. during the current year, and that there are something like 70 million tons surplus awaiting sale. We can set a magnificent example by restricting our output by law, but, with so much depending upon our export trade, this can be of little avail while some European countries are still developing coalfields and others are constantly devising new means of subsidizing their exports. In recent competition to supply the Norwegian State Railways, Northumberland, on the basis of its minimum price, was undercut by Poland by about 2s. 6d. a ton. With further increases in production costs inevitable as hours are reduced, it is difficult to see where events are leading, failing some international agreement not only upon output and prices, but also conditions of labour, and present prospects of anything of this kind are remote.

Bye-Products in 1930.

CONTINUED reduction in the price of this commodity has been the chief feature of the sulphate of ammonia trade during the twelve months under review. The decline in price during the last decade has reached such a point that were it possible to stop the recovery of ammonia at bye-product plants without creating a nuisance, many sulphate makers would now have closed down their works. The figures are illuminating, and if they are the one rosy spot in the farmers' outlook, this is small comfort to the producer.

Basis 25½ P.Ct. Ammonia Neutral per Ton of Sulphate.

	£	s.	d.
1918–19	19	7	0
1919–20	23	15	0
1920–21	23	0	0
1921–22	14	0	0
1922–23	15	6	0
1923–24	13	6	0

Basis 22·1 P.Ct. Nitrogen.

1924–25	12	6	0
1925–26	10	19	0
1926–27	9	16	0
1927–28	9	2	0
1928–29	8	9	0
1929–30	6	11	0

During the period 1923-24 to 1929-30 the world production of fixed nitrogen has rather more than doubled (1,057,000 tons increasing to 2,178,000 tons), while the total nitrogen producing capacity has increased nearly two-and-a-half times, and is now estimated at 2½ million tons, exclusive of Chile, which, in the last two years, has produced at the rate of nearly half-a-million tons of nitrogen. Consumption has not kept pace with this high potential output, and synthetic ammonia plant equal to a capacity of approximately 400,000 tons of nitrogen annually has been closed down. But for this closing down of plant by arrangement among the manufacturers, there is no doubt that still lower prices would now be the rule. Outside Europe, where no concerted action has been taken, prices have dropped to even lower levels—in Japan to well below £4 per ton. As prices decline, quality and appearance of the product become of greater importance, and there is no doubt that these factors are now influencing buyers. The article of higher quality and more pleasing appearance will always be chosen by the buyer, when prices are equal. It would be well for producers to look to this side of the business, and produce a material of the highest standard.

Reduction of costs of production has exercised the minds of all producers, and much useful information on this point has been furnished by a Committee of the Institution of Gas Engineers who have dealt with the subject. The general conclusions to be drawn from the report of this Committee, and from the various speakers who joined in the discussion when the report was read, in no way differ from those outlined in these notes twelve months ago. The way to the solution of the problem has been pointed out quite clearly and emphatically. Is it not time that the industry gave effect to the advice, and made this part of their activities as efficient as its other services to the public?

Tar and tar products have followed the decline in values, and the market for the two main products, pitch and creosote, is very difficult. The demand for road tar and road compositions has been good throughout the year, and it is likely that an increase of the order of 10 p.ct. will be recorded. An interesting point in this connection is the great difference in the quantities of tar consumed in different counties. Some counties may be called all-tar counties, the bulk of the roads being treated in some way or other with tar compositions; while others have a large proportion of roads treated with competitive materials. It would be instructive to have this point investigated. Is the cause one that can be remedied by closer contact between the buyer and the seller by scientific salesmen able to explain the advantages of tar in the language of the user? The non-skid qualities of tar surfaced roads are coming to be more recognized, and the motoring public are showing their appreciation of this point—perhaps the strongest of all the good points of tar.

The world production of tar is being seriously affected by the universal depression in the steel trade, especially in the United States, where the output of tar from coke-ovens largely exceeds that from gas-works. It is likely that the output in some countries will be affected to the extent of 40 to 50 p.ct. by shutting down of coke-ovens; and the effect of this on the tar products position may be considerable, as consumption of these products will not diminish to the same extent.

Of the other products the same story of falling prices has to be told. Crystal carbolic and cresylic acids, after being a firm market for the earlier months of the year, have fallen away, and the market is now very difficult. Naphthalene is a poor market, with sellers scrambling for orders. White spirits have remained a rather steadier market, but, again, in the latter months of the year, prices of the crude materials have tended to drop. Pyridine is almost unsaleable at prices which must mean a loss to makers. The benefits of co-operation in selling could be secured for all of these products, just as it has already been secured for some of them.

Gas Stocks and Shares.

THE financial disturbances both at home and abroad, and the long period of depression in most markets which has overshadowed the Stock Exchange for the greater part of the year, cannot be said to have adversely affected Gas Stocks and Shares as a whole, and in the few isolated cases where depreciation in price has occurred this has been so slight as to be almost negligible. Prices for the first six months showed very little change either way, but during the last half of the year a distinct improvement has taken place. Especially has this been so with regard to debenture issues, and almost every debenture stock quoted in the "JOURNAL" Stock and Share List has appreciated to an unusual extent for this class of security. In fact, investors in gas stocks must feel a very pleasant sense of security when comparing the solidity of such holdings with that of other, supposedly, high-class securities. Moreover, the capital which the industry is able to command, evidenced by the very large over-subscriptions to new issues which are made at various times, and

the unfailing regularity with which dividends are disbursed, in some cases at increasing rates, cannot fail to commend gas stock as a safe and sure investment.

It must not be forgotten that, in spite of intensified competition by State-aided electricity, the sales of gas are still increasing, though the extra capital required to meet this has been relatively small compared with our rivals—an important point from both the investor's and the consumer's point of view. The amount required for the Central Electricity Scheme is £50,000,000, and so far £23,000,000 of this sum has been borrowed. For some years to come, therefore, large amounts will be needed for payment of interest and sinking fund charges, and these extra costs will have to be passed on to the consumers.

It will be remembered that the year 1929 was a particularly bad one for investors generally, and the depression had some slight adverse effect on the market values of gas stocks. A glance at the following list of some of the larger ordinary issues shows that in many instances this has been overcome, and in some cases prices exceed those of 1928, which was a year of comparatively high values. It is gratifying to note the appreciation which has taken place this year in the stocks of the three Metropolitan Companies, as these were among the chief sufferers in 1929. A slightly increased dividend disbursement by the Gas Light and Coke Company would account for some portion of the large improvement in their case, but the rates paid by the South Metropolitan and Commercial Companies at 6¼ p.ct. and 6 p.ct. respectively have remained unchanged since 1927 :

Ordinary Stocks.

—	Quotations.		Increase (+) or Decrease (−) over 1929.
	Dec. 31, 1929.	Dec. 19, 1930.	
Alliance and Dublin	93 · 96	100—105	+ 8
Barnet	112—115	108—111	− 4
Bournemouth 5 p.ct.	12⅜—13¼	14¼— 15¼	+ 1½
,, "B" shares	12⅜—12⅝	12½—13	+ ⅜
Brighton and Hove 6 p.ct.	113—116	112—117	+ 1
,, ,, ,, 5 ,,	100—103	102—105	+ 2
Bristol 5 p.ct. max.	87—89*a*	93—94*a*	+ 5½
British	112—117	108—113	− 4
Cardiff	98—101	95 - 98	− 3
Commercial	90—95	95—98	+ 4
Croydon sliding scale	104—107	105 - 108	+ 1
,, maximum dividend	80—85	81—84	..
Derby	118—121*b*	115—125*b*	+ ½
Gas Light and Coke £1 units	17/9—18/3	19/9—20/3	+ 2s.
Imperial Continental	330—350	335 355	+ 5
Liverpool	91—92*c*	96 - 97*c*	+ 5
Newcastle £1 units	16/3—16/9*c*	16/9—17/3*c*	+ 6d.
Portsmouth 4 p.ct.	113—118	115 - 120	+ 2
,, 5 ,, maximum	80—83	80—83	..
Sheffield	104—106*d*	105 - 107*d*	+ 1
South Metropolitan	99—101	104 - 108	+ 6
South Suburban	101—104	102—105	+ 1
Southampton 5 p.ct. maximum	77—80	75—78	− 2
Tottenham	101—106	103—107	+ 1½

Quotations at : (*a*) Bristol, (*b*) Nottingham, (*c*) Newcastle, and (*d*) Sheffield.

The low rate of Bank interest which has been current during the greater part of the year, and the large available balances for investment, which in more normal times would be utilized for trade expansion, have both brought about a heavy demand for gilt-edged stocks. So much so, in fact, that the prices of these issues at one time reached a point when any capital appreciation appeared problematical and the yield unsatisfactory. Investors, therefore, had to seek a more profitable outlet, and were attracted to the many high-class debenture issues, among these being the debenture stocks of the principal London and Suburban Gas Companies. There are, it is true, many debenture issues of smaller undertakings which do not receive attention, as they are not quoted on the London or any other Stock Exchange, but when available these can sometimes be purchased at prices much below their true worth. This increased demand has given a fillip to prices, and some of the irredeemable variety are now quoted at values which have not been reached for some years past. The following are examples of appreciations recorded this year :

Debenture Stocks.

—	Quotations.		Increase over 1929.
	Dec. 31, 1929.	Dec. 19, 1930.	
Alliance and Dublin 4 p.ct.	62—65	72—77	11
Bournemouth 4 p.ct.	71—74	75—78	4
British 4 p.ct. red.	69—71	74—77	5½
,, 5 p.ct. red.	92—95	95—98	3
Cambridge 5 p.ct.	90—93	97—100	7
Commercial 3 p.ct.	54—57	57—60	3
Gas Light 3 p.ct.	56—58	60—63	4½
,, ,, 5 p.ct.	97—100	99—102	2
Imperial Continental 3½ p.ct. red	71—76	80—85	9
Maidstone, 3 p.ct.	52—55	55—58	3
South Metropolitan 3 p.ct.	54—57	60—63	6
South Suburban 5 p.ct.	92—95	98—101	6
Southampton 4 p.ct.	68—71	75—78	7
Sutton 5 p.ct.	90—93	96—99	6
Swansea 6½ p.ct. red.	97—99	100—103	3½
Tottenham 4 p.ct.	72—75	76—79	4
Wandsworth 5 p.ct.	91—95	97—100	5½

Preference stocks have also received a good measure of support, and the most noticeable increase among these is that of the South Metropolitan 6 p.ct. It will be remembered that the working agreement between this Company and the Commercial Company has increased the amount issued by £635,812. This stock is irredeemable, and ranks in front of the £6,709,895 ordinary stock, thus presenting a most attractive permanent investment. The price has increased 8½ points during the year, from 104-106 to 112-114. Another improvement of note is that of Gas Light and Coke 4 p.ct. preference, which has gained 6 points to 79-82.

The extra expenditure on distribution brought about by the ever-growing demand for gas necessitates the raising of fresh capital from time to time, and no difficulty is experienced in obtaining any requirements in this direction, all issues last year being largely over-subscribed. It was fairly obvious that in one case at least the "stag" was much in evidence. Applicants for gas issues are in the main genuine investors, and any operation of this nature must tend to reduce to a minimum the chances of obtaining their requirements. In this connection, a suggestion has recently been put forward which would appear to go a long way towards remedying the evil—viz., that applications for new issues generally should be in two forms : (1) Application money 10 p.ct., and (2) application money 50 p.ct., with preferential allotment to the latter applicant.

The following is a list showing some of the larger new issues which have been made during the year, and the prices obtained :

Company.	Class of Stock.	Amount Issued.	Price Realized.
		£	P.Ct.
February—			
Yorktown (Camberley)	5 % red. deb.	30,000	96 to minimum 93
Aldershot	5 % deb.	100,000	98 to minimum 93
March—			
Weston-super-Mare	6 % red. pref.	30,000	105 to minimum par
April—			
East Hull	5½ % red. deb.	20,920	103 to minimum par
May—			
Southampton	5½ % pref.	100,000	Average £98 0s. 8d.
Imperial Continental	Ordinary stock	300,000	Offered to stockholders at £250
July—			
Oxford and District	6 % red. pref.	50,000	Average £101 15s. 6d.
October—			
Bedford District	5 % deb.	20,000	Average £96 18s. 4d.
Gas Light and Coke	4½ % red. deb.	2,500,000	Issued at £91 10s.
Folkestone	5 % deb.	100,000	£95 net
November—			
Eastbourne	5 % deb.	60,000	Average £99 3s. 4d.
York	5 % red. deb.	90,000	Average £99 6s. 6d.
Bognor	Ordinary "A"	20,000	Average £125 18s.
South Suburban	5 % deb.	200,000	Average £100 3s. 4d.
,,	5 % pref.	300,000	Average £95 10s. 5d.
Tunbridge Wells	5½ % deb.	25,000	Average £107 3s. 3d.
December—			
Kidderminster	5½ % red. deb.	20,000	Average £102 4s. 5d.

CORRESPONDENCE

Obtaining Records of Retort Spalling.

SIR,—I note from your issue of Dec. 3 that during the discussion following the presentation of the 21st Report of the Refractory Materials Joint Sub-Committee, the President (Mr. H. E. Copp), in his remarks, suggested that a useful method of obtaining records of spalling of retorts would be to use plaster casts.

In his reply, however, Mr. Green treated the suggestion in a somewhat facetious manner, which, it would appear, implied that the idea did not commend itself to him as being a useful or practical method.

I therefore enclose (with Mr. Copp's permission) two photographs of plaster casts taken in 1928, which I thought would be of interest to those studying the behaviour of refractory materials in vertical retorts. No. 1 photograph is of a plaster cast of the spalled zone of a vertical retort after nearly four years at work. No. 2 photograph is of a plaster cast of a portion of a vertical retort where "holing" had occurred. This retort had also been in action for nearly four years.

Front Face Retort Wall.

Inner Side.

Outer Side.

No. 1.

No. 2.

In conclusion, I venture to suggest that a careful study of the photographs will prove the value of the President's suggestion.

RONALD A. WESTON.

British Gas Light Company, Ltd.,
Hull, Dec. 23, 1930.

Corrosion of Pipes.

SIR,—With reference to the meeting of the Institution of Gas Engineers and the Report of the Corrosion of Pipes Sub-Committee, you report the discussion which followed the report and mention Dr. Anderson's remarks regarding a new type of bandage, and Mr. Ruthven's reply thereto. As Mr. Ruthven stated that there are one or two points that the Committee cannot explain, we venture to draw your attention to certain publications in the Continental Press relating to this subject.

Drs. Beck and Jacobsohn, of the Kaiser-Wilhelm Institute, Berlin-Dahlen, writing in "Korrosion and Metallschutz" (Corrosion and Metal Protection), Vol. 5, No. 9, mentioned at length the phenomenon referred to, and many photographs showing results of tests were illustrated. Their "conclusions" states "The results of the experiments show that the electrical resistance of the material is not a test of its property to prevent corrosion."

In a special supplement the authors gave an opinion that "Denso" was a colloid, and that this was the explanation.

Since that date Dr. Beck has published two memoranda on the subject—namely: "A simple method for the quantitative determination of the atmospheric corrosion of protected metal tubes" ("Korrosion and Metallschutz," 1930, Vol. 9), and "The Theory of the Protective Action of the Schade Bandage" ("Korrosion and Metallschutz," 1930, No. 10); and a further very detailed article is now in the course of being printed.

Dr. Beck states in the article No. 9: "The high anti-corrosive property of the Schade bandage is here again demonstrated adequately," and in No. 10 states: "The value of a non-metallic protection of a metal against corrosion is usually measured by determining its electrical insulating properties. A positive result of such a test, however, is no indication of the protective properties of a moist Schade bandage. Such methods fail here, as in the case of another group of anti-corrosive media—viz., submarine rust paints. Ragg has proved beyond doubt that in this case electrical insulation and anti-corrosive properties do not go hand in hand."

We find it difficult to understand the reason for the difference between Continental opinion and British, but in the course of our connection with this bandage it has been easily apparent to us that, taken generally, the gas industry is woefully indifferent to corrosion; it is content to use methods which have proved to be ineffective, and rely upon the dressings provided by the tube manufacturers, who, to quote Mr. Lacey, "have done relatively little in the last twenty years."

In support of this bandage we quote Dr. Bertelsmann, who, writing in "Gas- und Wasserfach" (Gas and Water Trade), cited an example from Berlin:

"In the Senefelder Platz, at a place where tramways and an electric railway were adjacent, a main was laid which, in spite of being well asphalted, had to be changed every seven or, at best, every ten months. Finally, the mains were laid bare, cleaned, and bound up with 'Denso,' since when no trouble has arisen."

This was in 1927, and Dr. Bertelsmann informed us verbally this month that the main is still sound, and he anticipated it remaining so. Over three years against a maximum of ten months is sufficient recommendation; and in the Alexander Platz new 90 cm. and 100 cm. mains are being laid in a position where it is imperative that the best protection be afforded. "Denso" is being used *plus* a wrapping of jute and a coating of bitumen to afford an additional protection mechanically to the plastic dressing. The soil being light sand, there is a considerable amount of friction to be guarded against.

Dr. Bertelsmann commented that they could not afford to waste their pipes, and offered to give his experience to any British undertaking that asked for same.

We noticed recently that one of the principals of the gas in-

dustry said: "It is better to borrow experience than to buy it," and we suggest that anyone who desires the benefit of Dr. Bertelsmann's nearly four years' experience with "Denso" should take advantage of his offer.

S. B. COLES,
Paul Winn & Co., Ltd.

Tower House,
40, Trinity Square, E.C. 3,
Dec. 23, 1930.

Waste-Heat Recovery from Horizontals.

SIR,—I was interested to read in your issue of Dec. 17 Mr. E. Strother Davies' paper on "Waste-heat Boilers with Horizontal Settings;" and I venture to make the following comments upon it.

In the table on p. 862, the total heat used for carbonization is given to eight significant figures, so that, at any rate, the ten's figure is regarded as accurate and (considering the figure in the first column) the degree of accuracy is 10 in 53 millions or 1 in 5·3 millions. It would be interesting to know how such a degree of accuracy has been obtained. The degree of accuracy in a quotient or product cannot be greater than that of the least accurate figure used in the division or multiplication.

I would also like to know what exactly is meant by the phrase "total heat used for carbonization." Is it the weight of fuel used at the producers, multiplied by its calorific value? If this be so, then taking the C.V. of the coke used as 12,000 B.Th.U. per lb. (p. 863), the fuel burnt for carbonization can be obtained by dividing the total heat by the C.V. of the coke, so obtaining 4480 lbs., 4300 lbs., and 5320 lbs. of coke burnt for Nos. 18, 23, and 25 beds respectively. The fuel carbonized is equal to the total heat used for carbonization divided by the heat per lb. of fuel carbonized, giving 32,900 lbs. for each of the beds. The fuel consumption is therefore 13·6 p.ct., 13·1 p.ct., and 16·2 p.ct. respectively—figures which are considerably higher than the 10·4 p.ct. given on p. 861.

It is not at all clear what is meant by "total heat lost via surplus or waste gas," and also how from this figure the heat lost per lb. of fuel fed to the producers has been obtained. The total heat lost by the waste gas is equal to

Weight of waste gas × specific heat × (temp. ° F. − 32).

Taking the CO_2 content of the waste gas as 12 p.ct., the carbon content of the coke as 83 p.ct., and the specific heat of the waste gases as 0·24, then the heat available in the waste gas from the air heater is (considering only the figures in the first column)

4480 × 17·5 × 0·24 × (961 − 32) = 17,500,000 B.Th.U.,

from which the heat lost per lb. of fuel fed to the producers is 3920 B.Th.U., in good agreement with Mr. Davies' figure. Calculating the figures for the second and third columns on the above basis, the values for the heat lost in the waste gas per lb. of fuel fed to the producer are 4160 and 4560 (assuming that the waste gas top tube temperature for Bed No. 25 is 1111, and not as stated). This is equivalent to 35 p.ct. of the heat used in carbonization, agreeing with Mr. Davies' figure 19 + 15·74 = 34·74 p.ct.

The average CO_2 content of 12 p.ct. is stated to represent 125 p.ct. excess air. I cannot agree with this figure. Such a CO_2 content indicates about 75 p.ct. excess air. Does Mr. Davies mean excess *secondary* air? It would be of interest to know how he has obtained these figures.

An examination of the figures given to show the effect of the infiltration of air leads to rather striking results. The data given in the paper are not sufficient to say exactly what will be the weights of flue gases before and after the removal of the plug, but the ratio of the former to the latter will be very nearly 1 : 1·19 for the combustion of equal weights of coke. The specific heat of the flue gases will be almost the same in each case. On this basis the following table can be obtained:

—	Relative Quantities for Combustion of Equal Quantities of Coke.	
	Before Removing Plug.	After Removing Plug.
Heat entering superheater	459	539
Heat leaving boiler	214	245
Heat lost to boiler	245	294
Efficiency of heat loss, p.ct.	53·5	54·6

There is obviously some error in the data given in the paper.

It is also stated in the paper that the efficiency of heat recovery is proportional to the velocity of flow of the gases in the tubes. This can only mean that, if E is the efficiency of heat recovery, and v the velocity of the gases in the tubes, and R some constant,

$$E = Rv.$$

It would be interesting to know if Mr. Davies has deduced this law from his own experiments or whether he is quoting some authority. If the latter, will he kindly give the authority? If the former, the data from which the conclusion has been drawn would seem worthy of publication.

There appear to be a number of errors in the detailed table on the bottom of p. 863. The figure in the "Average" column for fuel per hour, lbs. of coke, should be 2222. The question of the accuracy of the equivalent excess air has already been discussed. Neither Callendar nor Marks and Davies' Steam Tables give saturated steam temperatures in agreement with those in the paper—they appear to be about 5° C. too high. The degree of superheat as calculated from superheated steam, and the saturated steam temperatures are in each case 32° Fahr. too high. The evaporation per hour in the "Monday" column should be 4900, and not 4970; and this error has led to errors in lines 21 and 22. What exactly is meant by "the extraction efficiency of the boiler?" The term is quite new to me. How have the figures for the calculated evaporation per lb. of fuel (line 26) been obtained, and what is the difference between these figures and those given in line 21—evaporation per hour per lb. of fuel? Should not this be evaporation per lb. of fuel? The "per hour" has no meaning. Line 34 gives the percentage heat recovered of total heat in waste gases. These figures appear to have been obtained in the following way:

$$\frac{\text{(Temp. of inlet gas to superheater} - \text{Temp. of gas at boiler outlet)} \times 100}{\text{Temp. of inlet gas to superheater}}$$

This will not give the percentage of recovered heat, because it makes no allowance for radiation losses.

A comparison of the heat lost by the gases while heating the boiler and that gained by the coater in the boiler leads to some curious results. In the absence of other data the weight of flue gas per lb. of coke has been calculated on the assumption that the coke contains 83 p.ct. of carbon and that 1 lb. of water per lb. of fuel finds its way into the flue gases either as moisture in the coke, or formed as a result of combustion of volatile matter in the coke, or as added steam. Thus we get:

—	Mon.	Tues.	Wed.	Thurs.	Fri.	Aver.
Lbs. of flue gas per lb. of fuel	18·6	19·0	19·0	18·7	19·3	19·0
Temperature of flue gas drop in boiler and superheater, ° C.	260·5	258	262·5	258	247	257·2
B.Th.U. lost to water in boiler and superheater, per lb. of fuel	2100	2120	2150	2080	2060	2110
Steam pressure	115	113	112	111	112	113
Saturated steam temperature, ° F.	347·4	346·2	345·6	345	345·6	346·2
Superheat temperature, ° F.	527	517	516	522	519	521
Superheat, ° F.	180	172	170	177	173	175
Total heat of 1 lb. of steam, B.Th.U.	1287	1282	1281	1285	1283	1284
Heat per lb. of boiler feed, B.Th.U.	79	91	83	87	85	85
Heat gained per lb. of steam, B.Th.U.	1208	1191	1198	1198	1198	1199
Water evaporated per lb. of fuel, less blow down	2·29	2·26	2·23	2·22	2·21	2·25
Heat gained per lb. of fuel, B.Th.U.	2770	2700	2670	2660	2650	2700

The above figures show that the heat gained by the water is nearly 30 p.ct. more than that given out by the gases. Two explanations are possible—either the test data are not accurate, or else the assumptions I have made in calculating the weight of flue gases are not justifiable. Mr. Davies' views would be appreciated.

To me the most interesting part of the paper is that dealing with water softening. The "Permutit" process of water softening will reduce the hardness to 1 part per 100,000, while the soda-lime method will remove all except 4 parts per 100,000. Either process leaves dissolved solids to be dealt with, usually by periodical blowing down. In the table on p. 863, blow-down losses for the "N.O.C." process are given, but none for the softener plant. Are we to infer that in the latter case there was no blow-down? It would be a matter of the greatest value if Mr. Davies would publish full details of the "N.O.C." process, especially in view of the remarkable results he claims for it, although one views with scepticism the guarantee that it will arrest corrosion apparently without the removal of dissolved gases or of magnesium chloride which under boiler conditions gives rise to acidity.

D. K. MOORE.

West Hartlepool,
Dec. 28, 1930.

OBITUARY

LORD MELCHETT.

Lord Melchett, Chairman of Imperial Chemical Industries, Ltd., died on Saturday last, and he will be mourned as one of the greatest industrialists and foremost personalities of our time. During 1925-26 he was President of the Society of British Gas Industries, and delivered his memorable Presidential Address on the coming-of-age of the Society in 1926. Members of the Institution of Gas Engineers who were present at

the annual meeting in 1925, which was held at the Institution of Civil Engineers, Westminster, will well remember the notable speech made by Lord Melchett, who was at the time Sir Alfred Mond, M.P., on the subject of bringing peace to industry. Mr. J. Ferguson Bell, M.Inst.C.E., was President of our Institution for that year, and it was due to his invitation that Lord Melchett attended.

ALEXANDER WADDELL.

The death took place on Monday, Dec. 22, of Mr. Alexander Waddell, late Gas Engineer and Manager at Dunfermline. Mr. Waddell had a paralytic seizure a week before, and was removed to a nursing home, where he died. He was in his 75th year.

Mr. Waddell for many years occupied a prominent position in gas affairs in Scotland up to 1918, the year of his retirement from Dunfermline. Possessed of an active mind, his progressive ideas and striking faculty of invention brought forth from time to time sound practical results, and while some were successful, many suffered the disillusion of optimistic hope. He will be remembered as the pioneer in Scotland of benzole enrichment of gas, to take the place of cannel and at a time when the Peebles oil process of William Young was in force. Later, along with his brother, the late Mr. Forbes Waddell, he designed the tubular form of regenerator for horizontal retorts, which was adopted in a large number of gas-works. An enthusiast of the vertical retort, about twenty years ago, he conceived the idea of adapting the design of retort in Scottish shale oil works, a low-temperature process, to coal carbonization in gas-works. His designs were put into practice at Dunfermline and elsewhere, but for reasons of failure to function successfully in practical working the system has not claimed attention.

Mr. Waddell was Chairman of the Informal Meeting of Scottish Gas Managers in 1902, and President of the North British Association of Gas Managers in 1910. He was successively Gas Engineer at Newtownards, Broughty Ferry, and Dunfermline. He leaves a widow, four sons, and three daughters. One of the sons, Mr. Robert Waddell, is Manager at the Polmont Gas-Works.

At the funeral, the North British Association of Gas Managers was represented by Mr. H. G. Ritchie, of Falkirk, the President, Mr. T. W. Harper, of Ayr, Vice-President, and Mr. J. W. Napier, of Alloa.

PERSONAL

Mr. JOHN SCOBIE, Technical Assistant to the City and Royal Burgh of Dunfermline Gas Department, has been appointed Engineer and Manager to the Stonehaven Gas Company. Mr. Scobie will commence his duties on Jan. 5. He succeeds Mr. W. Fred Vernon, who resigned.

Mr. ERNEST EDMUND BARNES, of Ashgate Lodge, Chesterfield, lately Chairman of the Grassmoor Collieries Company, Ltd., and a Director of the National Benzole Company, Ltd., who died on Nov. 5, aged 68, left estate of the gross value of £89,082, with net personalty £78,942.

Dr. L. PATRICIA EDWARDS (the elder daughter of Mr. R. W. Edwards, Chairman and Managing Director of the Aldershot Gas, Water, and District Lighting Company), now of the Royal Free Hospital, London, has been appointed House Physician to the Queen's Hospital for Children, Hackney Road, London, as from to-morrow. This hospital deals with larger numbers of cases than any other children's hospital in the country.

We extend our congratulations to Herr A. C. Becker, who has just completed twenty-five years' service with the firm R. Frister, and is a Director and Chief Engineer of the Progas Works. The esteem with which Herr Becker is held in Germany is evident from the graceful compliment which has just been paid him by the "Berliner Tageblatt" by the inclusion of his portrait in a recent issue of their Engineering Supplement as a leading industrialist. Our readers will recall the description of the Progas governor which we published a few weeks ago. This governor is adapted to being fitted to the inlet to consumers' meters, and, since the pressure on the outlet of the governor varies with the gas consumption, an adequate and uniform pressure is assured irrespective of the number of appliances in use. When undertakings install these governors they are enabled to increase the district pressure without fear of an abnormally high pressure in the neighbourhood of the works and an adequate pressure in the outlying districts. One of the constituent firms of the Progas-Union is the G. Kromschroeder A.-G., the makers of a well-known type of high-capacity meter capable of registering accurately loads varying from a single pilot flame to the maximum overload for which the meter is built. We trust that Herr Becker may long be able to continue his useful work for the gas industry.

Forthcoming Engagements.

Jan. 6.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual meeting of members in the Yorkshire district, at Leeds.

Jan. 8.—MIDLAND JUNIOR GAS ASSOCIATION.—Paper by Major W. Gregson, of Messrs. Spencer Bonecourt, Ltd., "Steam Generation in Gas-Works Practice."

Jan. 10.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Visit to the East Greenwich Works of the South Metropolitan Gas Company.

Jan. 10.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Joint Meeting with Eastern District in Glasgow, Address by Mr. R. B. Glover, A.M.Inst.C.E., A.M.I.Mech.E. (of West's Gas Improvement Company), "Some Notes on the Future of the Gas Industry."

Jan. 10.—WESTERN JUNIOR GAS ASSOCIATION.—Meeting at Bristol. Paper by Mr. H. C. Widlake, of Plymouth.

Jan. 12.—INSTITUTION OF GAS ENGINEERS.—Meetings of Executive Committee (2 p.m.), Finance Sub-Committee (3.30 p.m.), Finance Committee (4 p.m.), and Benevolent Fund Committee of Management (4.30 p.m.), 28, Grosvenor Gardens, S.W. 1

Jan. 13.—INSTITUTION OF GAS ENGINEERS.—Meetings of Council (10 a.m.) and Gas Education Committee (4 p.m.), 28, Grosvenor Gardens, S.W. 1.

Jan. 14.—INSTITUTION OF GAS ENGINEERS.—Meetings of Ammonia and Liquor Effluents Sub-Committee (10.30 a.m.) and General Research Committee (2.15 p.m.), 28, Grosvenor Gardens, S.W. 1.

Jan. 15.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual meeting of members in the Midlands district, at Birmingham.

Jan. 17.—YORKSHIRE JUNIOR GAS ASSOCIATION.—Visit to Bridge Street Distribution Department, Leeds. Paper by Mr. E. R. B. French.

Jan. 20.—SOCIETY OF BRITISH GAS INDUSTRIES.—Council meeting in the afternoon.

Jan. 21.—BRITISH COMMERCIAL GAS ASSOCIATION.—Meeting of Executive Committee (11.30 a.m.), 28, Grosvenor Gardens, London, S.W. 1.

THE NEWS OF THE WEEK

A Reduction in the Price of Gas in their Coast Area, of 0·2d. per therm (1d. per 1000 c.ft.), has been made by the Newcastle-upon-Tyne and Gateshead Gas Company.

The Annual Party and Dance of Messrs. Falk, Stadelmann, & Co., Ltd., was held at the Veritas Mantle Works, Wandsworth, on Dec. 23, a number of Directors being present. A most enjoyable evening was spent, and dancing was continued until the early hours of the morning.

The Social and Benevolent Section of Blackburn Corporation Gas Department held their Seventh Annual Social, Smoker, and Prize Distribution on Dec. 27 at the Greenbank Gas-Works. Councillor J. Holden, Chairman of the Gas Committee, presided, and Mr. G. P. Mitchell, Engineer and Manager, attended.

Salerni Carbonization Process, Ltd., of Trafalgar House, 11, Waterloo Place, S.W. 1, has been registered as a private Company, with a nominal capital of £100, to acquire patents, &c., relating to carbonization, and to carry on business as manufacturers of and dealers in power transmission mechanisms, &c.

In Spite of the Minister of Transport's Plea for the more general use of British tar for British roads, the Board of Trade reports a substantial increase in the quantity of highway materials imported from abroad. According to the returns for last year, published on Monday, Dec. 8, 199,476 tons of bitumen and asphalt, valued at £981,946, came to this country from abroad, as compared with 187,453 tons, valued at £886,868, in 1928.

An Interesting Comparison between the heat value in a therm of gas and in a unit of electricity is drawn by the Barnet District Gas and Water Company in a recent advertisement in local Press. They state that: "If we sold gas by the unit (containing 3412 B.Th.U.) our price would be 0·348d., or less than a halfpenny." And they point out that this price has no additions such as service charges and maximum demand charges.

The Darwen Gas Department are gradually replacing quarterly meters with slot meters to help people in straitened circumstances to keep pace with their accounts. Prosecutions for non-payment of bills have brought in full view the severe hardships through which many are passing, and the hope has been expressed by the Bench that the Corporation will do everything possible to secure satisfactory settlement to avoid, as far as possible, the execution of distress warrants.

Stoke-on-Trent to Give Bulk Supply.

The Stoke-on-Trent City Council, after a long discussion in Committee on Dec. 9, decided by thirty-eight votes to thirty-six to adopt a recommendation of the Gas Committee that an offer be made to supply gas in bulk to the Newcastle-under-Lyme Town Council and the Wolstanton United Urban District Council at 1s. 6d. per 1000 c.ft., subject to an agreement which should provide for a variation in the price of gas based on fluctuations in the price of coal.

Strong opposition to the proposal was led by Mr. C. H. Bowers, Chairman of the Gas Committee, who contended that it was unfair to consumers in the city of Stoke-on-Trent that outside areas should be supplied in bulk at so cheap a rate.

Supporters of the recommendation urged that as the city can produce gas at 1s. 1d. per 1000 c.ft., it is an economic proposition to sell to Newcastle and Wolstanton at 1s. 6d.

Truro Company's Revised Scale of Charges.

The Truro Gas Company have decided to revise their scale of charges as from Jan. 1, 1931, with the resulting decrease in the net charges for gas to the greater proportion of their consumers; only the consumers of very small quantities will not benefit, the price to them remaining unaltered.

To consumers of gas for lighting and general purposes rebates on the block system, from the standard price of 1s. 3d. per therm ranging from 1d. to 5½d. per therm, will be allowed on gas consumed in excess of 20 therms per quarter.

To consumers of gas for generating power, electricity, and certain scheduled industrial purposes, if measured through a separate meter, the standard price of gas will be reduced from 1s. 3d. to 12·6d. per therm, subject to rebates on the block system from the standard price, ranging from 1d. to 3½d. per therm on gas consumed in excess of 60 therms per quarter.

In addition to the above rebates, discounts on accounts exceeding 20 therms per quarter will be allowed at the rate of 5 p.ct. off the net charge of gas if the account is presented for payment on or before the last day of the month following the date of the account.

Consumers of gas measured through coin meters exceeding 10,000 c.ft. per half-year will be allowed a rebate on the block system ranging from 1s. to 1s. 6d. per 1000 c.ft. on gas consumed in excess of 10,000 c.ft. per half-year. Rebates will be refunded half-yearly.

Gas Restrictions.

Protest at "Victimization" of Council House Tenants.

The following letter, signed by "J. J.-Herbert," appeared in a recent issue of the "Star:"

"Restrictions on the use of gas are as a general rule confined to houses erected by Borough Councils having their own electricity undertaking. In these cases the Electricity Committee, regardless of the obvious fact that every shilling is indeed a shilling to the class of people concerned, insists on forcing the municipal commodity upon them regardless of their choice or pockets.

"The undertaking is regarded as a special hobby to be exploited at the expense of all and sundry in the absence of any organized protest on the part of the ratepayers. Consequently, when independent and discriminating householders refuse to bolster up the undertaking by spending considerably more than necessary by lighting, cooking, and heating by electricity, defenceless tenants of Council houses must be victimized.

"Unemployment is eagerly exploited on the plea that 'extension' work gives employment, regardless of the fact that the temporary labour involved would result in the displacement of permanent labour on a large scale.

"The extension work having been carried out, the problem of disposing of the additional current generated then arises. The use of electricity solely for lighting, cooking, and heating, even at the uneconomic rates adopted by some undertakings, is a doubtful luxury for the well-to-do. To coerce working-class families into incurring expenditure considerably in excess of that entailed by the use of gas is absolutely indefensible."

Consumers' Gas Company of Toronto.

Eighty-Second Annual Meeting.

The eighty-second Annual General Meeting of the Stockholders of the Consumers' Gas Company of Toronto, was held at the Company's Auditorium, 55, Adelaide Street East, on Monday, Nov. 17, 1930—the President, Mr. A. W. Austin, presiding.

The President, in moving the adoption of the annual report, said: The balance-sheet and report for the past year, indicating, as they do, continued progress in every direction, will, I am sure, be regarded by the shareholders as satisfactory. We have been able to add $65,437.00 to the special surplus account as a result of the year's working, and the plant and buildings renewal fund has been enlarged by $332,951.00. This fund, which now amounts to over $2,300,000.00, protects the shareholders' investment from loss through physical and functional deterioration. The balance-sheet shows that the Company's financial structure is both sound and conservative.

During the year the Directors established a Fellowship in Gas Research with the Ontario Research Foundation, for the investigation of such technical problems as may arise from time to time relating to the Company's business. A gratifying feature of the year's operations has been the continued success in extending the use of gas in large volumes for industrial operations. Although some of our large industrial customers

found it necessary to curtail their consumption of gas during the year, sufficient new business was obtained, which not only compensated for the temporary reductions in the business of older customers, but effected a substantial increase in the total volume of gas sold for industrial purposes as compared with the volumes sold last year.

British Chemical Plant.

Arrangements for Next Year's Exhibition.

The British Chemical Plant Manufacturers' Association, 166, Piccadilly, W. 1, have circulated a memorandum containing the regulations and instructions for exhibitors, and also the space application and agreement form for the "Exhibition of British Chemical Plant, 1931," which is to be held in the Central Hall, Westminster, S.W. 1, from July 13 to 18 (the Jubilee Celebrations Week of the Society of Chemical Industry). It is felt that this provides a unique opportunity for bringing British chemical plant and equipment, in particular the recent advances whch have been made, to the notice of industrialists in this country and abroad.

The Exhibition, the memorandum points out, is not being run as a money-making proposition; its sole object is to demonstrate that in variety, design, and quality, British chemical plant is second to none, a fact which is not yet fully appreciated, even in this country. The Exhibition should further prove that the industry can stage a display as interesting and attractive as the German chemical plant exhibition at Frankfort ("Achema").

The Chemical Engineering Group of the Society of Chemical Industry are organizing a comprehensive exhibit at the Central Hall at the same time, in conjunction with the Department of Scientific and Industrial Research and various Research Associations, to demonstrate the important part which science plays in the development of British industry and in the control of its products. There will be the closest co-operation between the Group and the Association in the organization of the two Exhibitions.

Application for space should be submitted as early as possible, and in any case not later than March 31, 1931.

THE NEWS—*continued.*

IN CONTINENTAL COUNTRIES - - -

Abstract Translations from the Technical Press of France and Germany.

OPERATING AND ECONOMIC ASPECTS OF HEATING CARBONIZING PLANT WITH COAL GAS.

The subject is discussed with special reference to inclined chamber ovens by H. Müller and Herr Stief in Das Gas- und Wasserfach, 1930, **73**, 1177-1180 (Dec. 13). Conditions prevailing in the works with which the paper deals were rather abnormal in that the carbonizing plant was apparently much larger than it need have been. Consequently some of the financial details are not universally applicable.

The economic advantages of coal gas firing compared with producer gas firing for coke ovens have been discussed by the first author. It was decided to investigate whether the same considerations would apply to the Hamburg Gas-Works. The severe winter of 1928-9 and the resulting scarcity of coke emphasized the importance of the question since coal gas firing would be the best means for increasing the coke make very rapidly by a large amount—namely, 60 p.ct. The Tiefstack Gas-Works with its inclined chamber ovens was a very suitable plant for the investigation. Calculations showed that a good financial result should accrue from a change in the firing system, hence in the summer of 1929 one chamber was heated with town gas (a mixture of 75 p.ct. coal gas and 25 p.ct. water gas) and, after the preliminary difficulties had been overcome, the whole setting of 98 chambers could be heated in this way in the winter of 1929-30. The plant was constructed for producer gas firing from a central battery of producers. The recuperators for the gas were at the charging side of the chambers, those for air being at the discharge side. In each case, preheating to a temperature of 1470° F. was effected.

A gas main was installed along the front of the setting and could be supplied with straight coal gas or town gas. From it, pipes carrying the burners branched off. At first, simple tubes extending into the setting were employed as burners, but, as was to be expected, heating was very uneven, owing to the shortness of the flames, and sooting up of the burners occurred. Hence recourse was had to the expedient of diluting the fuel gas with waste gas. For this purpose, injector burners were employed, so that, with gas under pressure, a sufficient volume of waste gas was induced from the recuperator without need of a blower. Relatively even heating of the chamber walls was then achieved. An alternative successful method of diluting the gas is to burn producer gas in a separate burner at the normal position at which the producer gas would enter the recuperators when producer gas firing is employed and to let the resulting waste gas pass through the recuperators to mix with the straight coal gas or town gas at the front of the chamber. A third method for diluting the gas is to mix the straight coal gas or town gas with low-grade producer gas. Tests with various mixtures showed that a gas of *net* C.V. between approximately 210 and 260 B.Th.U./c.ft.* was the most satisfactory, a suitable gas being a mixture of equal volumes of town gas and producer gas with *net* calorific values of 410 and 115 respectively. Of the available heat in this mixture, 78 p.ct. is contributed by the town gas and 22 p.ct. by the producer gas. This means that, by substitution of this mixture for producer gas for firing purposes, the producers would, instead of working at full capacity, be working at not more than 22 p.ct. of their capacity. Control of the calorific value of the mixture was secured by use of an automatic calorific value regulator. Naturally, it was necessary to arrange means to prevent overheating of the chambers by town gas in case of failure of the producer gas supply.

On a competitive basis, and on the assumption of equal efficiencies, the maximum costs, for firing purposes, of debenzolized gas and town gas relative to producer gas would be in the ratio of their *net* calorific values (450, 410, and 115)—namely, 3·91 : 1 and 3·56 : 1 respectively. On the assumption of a coke cost of 25s. per ton and producer operating costs of 6s. 6d. per ton of coke gasified, and with a yield of 16,500 c.ft. of producer gas per ton of coke, the cost of producer gas would be 2·29d. per 1000 c.ft. The maximum competitive costs of debenzolized gas and town gas would thus be 8·95d. and 8·15d. per 1000 c.ft. respectively. This would apply if the high calorific value gas were purchased for use in firing the setting, but is not of as much interest as is the case in which the gas is made. In the latter case, the cost of fuel per ton of coal carbonized is of interest. On the assumption that the heat requirements per pound of coal carbonized are 1282 B.Th.U. (*net* basis) as is the case with the chambers under consideration, the cost of producer gas firing would be 4s. 9d. per ton of coal carbonized.

With use of gas of high calorific value for firing, the weight of coal carbonized must be higher for the same make of gas for sale. This was accompanied by a not insignificant increase in revenue from bye-products. This increased revenue can only occur if the return from bye-products exceeds the cost of coal and was, in fact, realized, since the cost of coal was 20s. per ton and the revenue from bye-products 25s. The above mentioned increase in throughput must be 64 p.ct. when town gas firing is employed or 90 p.ct. with straight coal gas firing. In order that an idea may be obtained as to the effect of increased throughput, the cost of production of the town gas sold must be worked out for the case of producer gas and coal gas firing. The following table is based on actual working results, and capital charges are included. The results showed a gain of 2s. 11d. per ton of coal compared with producer gas firing, or a reduction in the manufacturing cost of town gas equal to 1·8d. per 1000 c.ft.

The advantages of replacing producer gas firing are the greater the more coal can be carbonized; the more coal gas is used for firing, the smaller the gas yield. The profit point in relation to revenue from bye-products is such that with a coal cost of 20s. per ton, the revenue from bye-products must be 21s. This applies if the capital charges are increased when town gas firing is practised. If, however, sufficient carbonizing capacity is available to render possible the extra throughput, the revenue from bye-products need be only 20s.

It has been demonstrated above that with specified assumptions, the introduction of coal gas firing can effect a reduction in the cost of gas manufacture, but this can only apply if there is a certainty of disposing of the extra coke make at normal prices, and if the necessary carbonizing capacity is available. There are, however, various advantages in operation, apart from the question of economics—namely, that the carbonizing plant can operate year in and year out under absolutely uniform

* All figures in this abstract are based on gas at 30 in., 60° Fahr., satd.

Cost of Gas Manufacture in 1930.

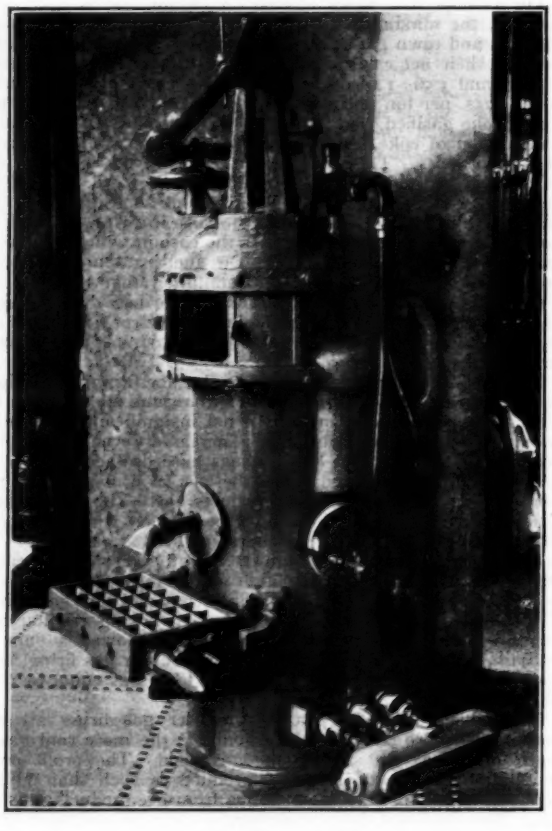
—	Producer Gas Firing.		Town Gas Firing.	
	Shillings per Ton of Coal.	Pence per 1000 C.Ft. of Town Gas Made.	Shillings per Ton of Coal.	Pence per 1000 C.Ft. of Town Gas Made.
Debit—				
Coal	20·0	12·4	20·0	12·4
Coke for firing	5·0	3·1	..	..
Town gas for firing	..	..	8·63	5·3
Coke for boiler	1·2	0·7	1·20	0·7
Coke for water gas	2·3	1·4	2·30	1·4
Operating costs	4·5	2·8	3·62	2·3
Labour	7·0	4·4	4·66	2·9
Capital charges	10·0	6·2	6·70	4·2
Total	50·0	31·0	47·11	29·2
Credit—				
Coke + bye-products	25·0	15·5	25·0	15·5
Net cost of gas	25·0	15·5	22·11	13·7

conditions. It is no longer necessary to cut down the gas make on Sundays by reducing the combustion chamber temperature. The holder capacity can be smaller without creating difficulties. For many weeks the setting worked uninterruptedly with a uniform number of charges without any regulation of the firing or the temperature. Normally, producer gas firing is practised. If, on a Sunday, too much gas is being made, the requisite number of chambers is turned on to town gas firing by the turning of a few valves and all difficulties are immediately overcome. These advantages cannot be expressed in terms of money, but they are of great benefit as regards life of settings and regular working.

The varying economic conditions which have to be countered nowadays render it necessary that gas-works operation must be amenable to instant adaptation to changing circumstances. There must be a possibility when coke is scarce of switching over to firing with coal gas. No settings should be constructed with built-in producers, but, on the contrary, the settings should be constructed for compound firing. This, however, enables fluctuating conditions to be met only partially since, when occasion demands, there must be a possibility of reducing the quantity of coke for sale without sacrifice of revenue. The quantity of coke can be reduced either by carburetted water gas manufacture or by complete gasification. These methods are, so far, only applicable under certain conditions. Manufacture of carburetted water gas is expensive, and the problem of complete gasification has not yet been solved satisfactorily. Hence there is urgent need for further investigation.

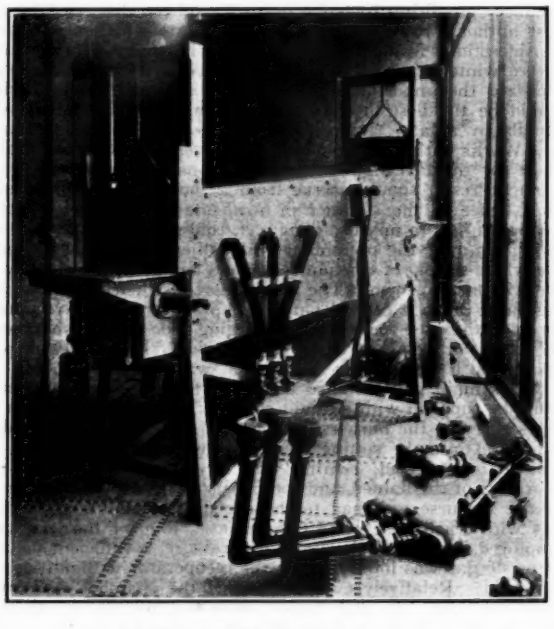
Demonstration of New Gas Furnaces

As was stated in the "JOURNAL" for Nov. 26 last, Messrs. Sir W. G. Armstrong Whitworth & Co. (Engineers), Ltd., of Newcastle-on-Tyne, recognizing the fact that in modern industry heat is a more important factor than power, and that gas has proved itself the most convenient form of potential heat, are producing at their Scotswood Works an extensive range of gas-heated industrial furnaces and appliances. The accompanying photographs show some good examples of these, at present being demonstrated in the Newcastle-upon-Tyne and Gateshead Gas Company's Granger Street Showrooms.



Gas-Fired Printers' Furnace.
Used for Ingot Casting and Refining Metal for Linotype and Monotype Machines.

In keeping with recent developments in printers' machinery, the casting and refining of linotype and monotype metal has advanced in a corresponding degree. Messrs. Armstrong's new soft metal refining and igniting furnace, offering the printer all he can desire in this direction, is illustrated. Automatic temperature control, a standard on these furnaces, avoids metal wastage, and the specially designed casting tray ensures metal of a clean and reliable nature. Certain railway shops have adopted Messrs. Armstrong's patent chain conveyor gas heater de-metalling furnace (also illustrated) in order that the bearing-metal mass be reclaimed from their worn locomotives and carriage bearings.



Gas-Fired Chain Conveyor Furnace.
Used for De-Metalling Locomotive Bearings (can be modified for continuous heat treatment uses). Foreground: Conversion Burner Set. Used in converting solid Fuel Fired Soft Metal Melting Furnaces to Gas.

Other types of furnaces being produced by Messrs. Armstrong include one for lead melting, for feeding lead presses and general lead scrap and alloy melting, of from 2 to 4 tons (lead) capacity. It has been arranged that any of Messrs. Armstrong's wide range of industrial gas furnaces can be tested by manufacturers interested at the Newcastle Gas Company's Industrial Laboratory. In this Industrial Service Laboratory there is a well equipped plant capable of dealing with any industrial heat problem. The Laboratory and the technical staff attached thereto are at the free disposal of any manufacturer for experimental or research work in any industrial sphere.

THE "JOURNAL" TECHNICAL RECORD

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Yorkshire Junior Gas Association

Lecture on Waterless Gasholders

A lecture of great interest on the subject of waterless gasholders was given before the members of the Yorkshire Junior Gas Association, on Dec. 13, by Mr. L. Hartley, a Director of Messrs. Clayton, Son, & Co., Ltd., gas constructional engineers, of Leeds. The meeting was held in the City Council Chamber at Leeds Town Hall, and Mr. J. W. Horwill, of Bradford (President of the Association), presided over a large attendance.

WATERLESS GASHOLDERS.

By L. Hartley, M.I.Mech.E., M.Inst.Gas E., of Messrs. Clayton, Son, & Co., Ltd.

The lecture was illustrated by a large number of excellent lantern slides showing waterless holders in various stages of construction. The author dealt with the assembly of the "M.A.N." holder, particular examples, considered at length, being the holders erected at Coventry and Birmingham.

Among the many advantages of the waterless holder, perhaps the one which makes the strongest appeal to the majority of gas engineers is the constant pressure, which is a prominent feature. In practice this means that a waterless gasholder represents effective capacity as distinct from nominal capacity. It is a well-recognized and undeniable fact that a telescopic gasholder of any given capacity needs the assistance of boosting plant in order to restore the drop in pressure attendant upon the falling of each lift when gas is being withdrawn. In other words, unless boosting is resorted to, the actual effective capacity of a telescopic gasholder may be only 20 p.ct. to 50 p.ct. of the nominal capacity for which it is designed.

This constant pressure may easily render it unnecessary on small or medium sized works to install boosting plant, and where holders are employed for district purposes away from the main works, the advantage of a steady pressure as given by the waterless holder is obvious. Again, the absence of the water, apart from its weight, is a feature which may have benefits in several directions. The severe weather of the 1928-29 winter emphasized the disabilities under which the ordinary gasholder suffers in respect of freezing of water in the cups, &c. Numerous water-sealed holders sustained damage in varying degrees, and even where no actual injury to the holder resulted, considerable anxiety was inevitable. Reports which we have show that waterless gasholders worked perfectly throughout that winter, not only here but in other countries, where the frost was even more intense.

Many of you have had a telescopic holder requiring repairs, and found difficulty in getting rid of the water—for obvious reasons. Or have found it necessary to have repairs carried out with the water in the tank, at a consequent increase in cost. I know many tanks to-day which, for various reasons, cannot be emptied. Then, again, leakage of gasholder tanks is by no means uncommon, and may give rise to serious trouble. All these points are absent with the waterless holder. It is found in practice that gas leaves a waterless holder in a drier condition than that stored over a water tank, and this has a tendency to reduce corrosion in the mains and services, and also reduces the amount of pumping of syphons required. A waterless gasholder certainly contributes towards a solution of these difficulties.

Another important point I should mention is the question of painting. With the waterless holder, atmospheric influence alone has to be considered. Painting, therefore, is less frequently required—say, in four or five years, as against every second year—and the holder retains a uniform appearance at all times.

An Aid to Aircraft.

In this country and America, gasholders, and particularly waterless gasholders, are being used for aircraft-direction purposes, in addition to their chief function as storage units. With waterless holders the method adopted is to place a powerful beacon on the roof of the holder, in addition to which an arrow and an indication of the distance to the nearest landing ground may be painted across the roof. The idea has much to commend it, and in view of the development of commercial airways, one may expect that increasing use will be made of holders in this direction. A typical case is the 20 million c.ft. holder at Chicago. The mast on the top is 75 ft. high. The lights on the top are arranged to flood the whole of the crown of the holder, and the words, "Chicago Municipal Air Port—2 miles," are painted, covering the whole roof, with an arrow across the centre showing the direction of the air port. It is 280 ft. in diameter and 373 ft. high, which, with the mast on the top, gives a total height of 448 ft.

Once the waterless holder is in commission, it needs very little attention in the way of supervision. Of course, when any new plant is first put into use, one naturally gives special attention to it; but as it is found to be working satisfactorily, it gradually becomes an every-day feature of the plant, and so after a short time it develops into a routine job for one of the regular employees to take a reading of the pump runs, and occasionally lubricate the guide rollers on the piston, or take a dip test of the sealing liquid in the seal.

In addition to the indicator for reading the contents, it is quite a simple matter to arrange a distant control at any convenient point, although in most cases this may be considered an unnecessary luxury, while in others it may solve a very real difficulty in an ideal manner.

Upkeep.

The question of upkeep is one which requires serious consideration with any type of plant. Even that most neglected unit, the ordinary water-tank type of holder, needs attention at times, and I am pleased to say engineers to-day are certainly beginning to realize this fact, and are giving more attention than they have in the past.

The upkeep of the waterless holder resolves itself into a very simple matter. I have just referred to the occasional reading of the pump runs, &c., and with regard to the consumption of electric current I need only mention that as the pumps operate very intermittently, the consumption is almost negligible. At Northwich, for instance, the average pump runs amount to only 7·7 per day, with a total current consumption of 176 units from the time the holder was put into operation in March last to the end of October—a period of 7½ months. Again, a 1 million c.ft. holder recently completed in this country is consuming approximately only 12 units per week. If you take these at 1d. per unit, it certainly does not amount to much.

As engineers, you will naturally raise the question—Is the waterless gasholder cheaper than the water-tank type? To which I would answer that much depends upon the circumstances. Certainly with the larger sizes the waterless will come in cheaper, but with the more common sizes the advantages have to be carefully considered, and first cost is not always the deciding factor.

In this country, as in no other, the spiral holder is a serious competitor, but even when dealing with spiral holders, the lowest price is not always the cheapest, or the best value. The net or usable capacity of a gasholder at peak load times is a condition which should not be lost sight of, and one must remember that a two-lift holder giving the required pressure when fully inflated may require half its capacity boosting to give useful service, whereas a waterless of the same capacity would deliver the whole volume at the required pressure. Therefore, as a natural consequence, it follows that a waterless holder of half the capacity would give the same service.

Design.

Now just a word with reference to the designing of these holders. You will be interested to learn that every single

member and rivet is carefully considered in the calculations. Some of the calculations are of a very intricate nature, and certainly require very careful consideration.

Discussion.

The PRESIDENT (Mr. J. W. Horwill) said the meeting was indebted to Mr. Hartley for a very exhaustive address on this important subject of waterless gasholders. He had been so clear and concise in handling his subject that they had been able to follow the whole process of preparation and erection of this new type of holder and would now have a much fuller appreciation of the particular advantages claimed for that type. They had, indeed, by the aid of the pictures, spent an afternoon almost "on the job" itself. The firm of Clayton, Son, & Co. were shown by the lecturer to be extremely well equipped for this important work. The factor of time in the provision of a new holder, as shown by that remarkably rapid erection of a waterless holder at Birmingham, was a matter of great importance to a gas undertaking and must go far towards increasing the demand for this type of holder.

Mr. R. CROWTHER (Elland), the Hon. Secretary of the Association, commenting on the description of specially long stanchion holding-down bolts, for adjustment in case of a holder getting out of the strict level owing to subsidence of the ground, asked the lecturer whether the particular holder he had mentioned—in illustrating these bolts—was the only case experienced in which level had been disturbed. He would like to know, also, whether this disturbance of level had any effect on the tar seal, or did the rubbing plates automatically adjust the seal? Mr. Crowther did not recollect that Mr. Hartley, in his lecture, had definitely mentioned the condition of the tar required in this seal. Was there any special treatment that it required before being used for that purpose? Also, was there any particular trouble with the weights used for keeping the rubbing bars in position?

Mr. HARTLEY, replying, said that up to the present there had been occasion to lift the level of only four waterless gasholders. They were all in areas subjected to mining subsidence—two of them in the Ruhr. There had been no occasion in this country, as yet, to adjust the level of any holder. Naturally, any holder would be liable to give trouble if it got out of the level. Sometimes they found that the ordinary water tank type of holder had settled owing to the nature of the ground. If it settled level all was well, but if not it put a severe strain somewhere. There had been a good many occasions on which, through settlement or through wear on the carriages, or sometimes owing to neglect, a water tank holder had gone out of the level, with consequent loss of seal in the cup and of gas. Mr. Hartley said he had known a good many cases of a whole lift of gas being lost through going out of the level. In the case of the waterless holder Mr. Crowther was probably thinking of the tar flowing round to one side if the piston got out of the level. To provide against this possibility there was a dam on every alternate column to prevent the tar from flowing round in such event. If the tar were allowed to run round it would add weight on the dropped side and aggravate the trouble. In answer to the question as to condition of the tar, Mr. Hartley said there was now a standard specification for ordinary waterless gasholders in England. It differed from the specification of the tar used in Germany, because in this country it was very rarely that the gas was stripped, as was always the case in Germany before it went into the holder. In the case of a blast furnace holder the specification for the sealing tar was altogether different. Most blast furnace gases were almost equivalent to a stripped gas. The ideal specification for a sealing tar, said Mr. Hartley, was one which would make the tar so that it was the same viscosity in winter as in summer. The question of the light oils in the English gas was one which made the difference between English and German specification for sealing tar. In winter the tar would be inclined to give up the light oils to the gas, and *vice versâ* in the summer. For that reason, as soon as Messrs. Clayton got an order for a waterless gasholder, they inquired about the gas and recommended a tar specification to suit. Of course, that was not a constructor's question really, but it was an important factor in giving satisfactory service, and the firm had in that respect received very valuable help from Mr. Bilborough, of the Yorkshire Tar Distillers, who, of course, was a chemist and who was giving special consideration to this subject. In answer to Mr. Crowther's question as to the weights of the rubbing bars giving trouble, Mr. Hartley pointed out that these were concrete weights put on to the piston and all fastened down, and once they were in position there was no trouble with them.

Mr. A. WHITEOAK (Hebden Bridge) said he understood Mr. Hartley to have stated that owing to the absence of a water tank, the waterless gasholder resulted in a marked improvement in regard to condensation on the district. He (Mr. Whiteoak) wondered whether that was a very noticeable improvement, because, if so, it rather suggested that the presence of water in the case of the ordinary tank holder was largely responsible for the district condensation troubles of gas undertakings generally. It would be interesting if Mr. Hartley could give any actual statistics as to the condensation difference between the two forms of holder.

Mr. HARTLEY said he was sorry he was not in a position to give any precise figures in answer to the last question. The whole question of dry gas, of course, was very much to the fore just now. Mr. Prentice, of Ipswich, had recently given some figures which showed a big saving in the amount of pumping from the syphons when a waterless holder had been put on

Mr. J. RICHMOND (York) asked for more detail as to the provision made for the smooth passage of the rubbing bars over the circumferential joints, and what clearance there was in the guide rollers between the actual roller and the vertical strip. He would like to know, also, whether evidence had been found of any tendency for the piston to twist. Would the ventilator at the top of the waterless holder be sufficiently large to deal with a whole make of gas put into the holder in the night, or was there some emergency seal? Further, had Mr. Hartley calculated the difference in barometric pressure consequential on a slight drop in height?

Mr. HARTLEY said the joints on the side plates were not exactly a right-angle on the outside. At one operation it was almost impossible to do that with a steel plate, but they were as near a right-angle as possible, and each time the rubbing bar passed one of the joints, until the holder had been in commission some little time, a certain amount of tar was liable to lodge in the corner. That tar fell to the bottom and was pumped back, but in time these small spaces became gradually filled up by the tar stopping in the corner setting and thus preventing further tar from leaking past. It was quite understood that in a new holder there was a slight leakage of tar in this way, but it was so small as to be almost negligible. There was no clearance in the guide rollers; the ideal was to have a very stiff piston and put all the rollers up and get level. If one had to allow clearance they would probably have the piston rocking a little. Any tendency for the piston to twist was overcome by fixing diametrically opposite the growing stanchion a guide which not only ran on the face but on the right edge, so that it could not possibly move in a circumferential direction. Mr. Hartley believed that was one of the reasons for the adoption of the polygon shape of the waterless holder. The ventilators at the top were large enough to take the whole of the make and be equal in area to the inlet pipe. The point of constant pressure was sometimes questioned. There was a variation due to the barometric pressure. If an engineer wanted the holder to give 10-in. pressure, that pressure—so far as concerned construction in this country—would be put at the outlet, and the holder would be made to give 10-in. pressure in any position so that when the piston was nearly at the bottom the engineer would get rather increased pressure. The constructors worked on the minimum pressure which the engineer desired at the outlet.

Mr. V. J. J. SIDDONS (Barnsley) asked whether the gauge of the plates of the holder was uniform at the top and bottom, and if there was any difference between the piston plates and the holder side-plates. In the case of a very high holder was there any liability to distortion by effect of wind pressure? If the plates of a high holder were sprung at all by wind pressure, did that distortion tend to tighten things up a bit generally?

Mr. HARTLEY replied that the gauge of the side plates was constant from top to bottom. The question of wind pressure, so far as concerned the thickness of the side plate, was really of no account, because if they were strong enough to carry the gas pressure from inside they were strong enough to carry the wind pressure from outside. The holder was, of course, subject to wind pressure, and that had to be calculated for. The risk of overturning had to be reckoned with and provided against, because wind pressure tended to have an uplifting movement, and the holders therefore were very strongly fastened down. The roof itself was in the form of a strong girder, and the stanchions were held firmly at the top and the bottom. There was a certain amount of spring in the rollers when they were first put on, but they were adjusted so that when the pressure was put on they were tight, but not too tight, against the roller path.

Mr. RALPH HALKETT, jun. (Sheffield), asked if Mr. Hartley had had any experience of the use of waterless holders as relief holders on a water gas plant.

Mr. HARTLEY said he had little doubt the question of specification of the tar could be arranged for such relief holder purposes, but he felt that that was a matter for the decision of a chemist rather than a constructional engineer, and he would prefer to refer any definite answer to a chemist.

Mr. D. T. LIVESEY (Doncaster) moved a vote of thanks to Mr. Hartley and to Messrs. Clayton, Son, & Co. for the lecture. Frankly, he could not say that he agreed that the appearance of these very high waterless gasholders was pleasing. Indeed, the straight horizontal lines were rather monotonous; but, after all, they of the gas industry were out for efficiency rather than architecture, and he thought they could take it that the waterless gasholder had come to stay. From the point of view of efficiency Mr. Hartley had put forward some very sound evidence. The record of the speedy Birmingham job was one of which any firm would be proud. Mr. Livesey said he had on various occasions heard men express fear of gas leakage, despite the tar seal, and he had been very glad to learn from Mr. Hartley's lecture that during the erection no tar was necessary to seal the piston, and he was sure that if a piston would hold without any seal there could be little doubt that it would hold with a tar seal.

Mr. J. W. WOOD, M.Sc. (Leeds), seconding, said Messrs. Clayton were prepared to tackle any size and type of gasholder work. Now that they had gone in for the manufacture of waterless holders they proved themselves thoroughly up-to-date. Mr. Wood said he had himself seen a number of these waterless holders in operation in Germany, and he had also seen many sections and models of the inside of pistons, but the charm of that afternoon's lecture had been to hear and to see, by the aid of the excellent pictures, the various stages of making and erecting this type of holder, showing what a heavy job it was and what great care was taken in carrying it through. Mr. Livesey had raised the question of the possibility of leakage of gas above the piston. That question had, indeed, been raised in a discussion on these holders at the Institution of Gas Engineers in June—not so much a leakage because the seals were not tight, but the small amount that might gradually accumulate by diffusion. Mr. Wood would like to ask the lecturer whether there was any risk of gas accumulating above the piston by such means to such a degree as eventually to become harmful to workpeople having to go down to attend the loaders, &c., or sufficient to give an ultimate risk of explosion. There appeared to be no mechanical system of ventilation, but only the natural ventilation through the crown, and this difficulty of gas above the piston might arise when the piston was some distance down the holder.

Mr. HARTLEY, replying to the vote of thanks, said an even better way to examine the various members of these holders while in course of construction, than by pictures, was to visit Messrs. Clayton's

works when they were engaged on such a job. He had no doubt at all that members of the firm and senior members of the staff would be very glad to receive the members of the Association at the works on some such occasion if they could fit a visit into their programme after giving the firm due notice of a week or two so that they could be sure the date of the visit would coincide with a period when they had something really substantial to show in this kind of work. As to criticisms of the appearance of waterless gasholders, the public were always ready to condemn something new and the spiral gasholder had been subjected to the same criticisms, but the public of a district concerned soon got accustomed to these things. Perhaps they became educated to the architectural features of a gasholder. The same thing had applied to the ordinary gasholder, but the public had now been used to them so long that they hardly noticed them at all to-day. In regard to the question of gas above the piston, Mr. Wood had almost answered the question himself when he said the piston rising and falling cleared the space every time it came to the top. He had never heard of any trouble arising from gas above the piston; he had heard of one instance in which a man lit a cigar while standing on the piston of a waterless gasholder which was in use, and he felt that however safe a holder might be made a thing like that was rather silly and hardly fair either to the gas undertaking or the constructors of the holder.

Mr. J. J. BAINES, Managing Director of Messrs. Clayton, Son, & Co., Ltd., said he endorsed Mr. Hartlev's invitation to the Yorkshire Junior Gas Association to arrange a visit to the Clayton works as soon as convenient when they had in hand some of this waterless holder work. The lecture, of course, was not intended to advertise Clayton's work but to help in encouraging modern development in gasholder equipment. The waterless holder had not been in use very long anywhere, and therefore it was by no means easy to get hold of detailed information as to its results with the passing of time.

On the motion of Mr. J. RICHMOND (York), seconded by Mr. L. R. COWLEY (Shipley), the hearty thanks of the meeting were expressed to the Leeds Corporation and the Town Hall Superintendent for the use of the room and facilities for the meeting.

Coking a Banded Bituminous Coal: The Part Played by Each Band*

By C. P. FINN, M.Sc., F.I.C., M.I.Chem.E.

INTRODUCTION.

Visual examination of British bituminous coals shows that four types of coal are interbanded in most seams. These banded ingredients have been described by Stopes and Wheeler† as follows:

Vitrain occurs as definite rather narrow bands, often markedly uniform in thickness for considerable distances, and commonly about $\frac{1}{8}$ to $\frac{1}{4}$ in., but such are very seldom more than $\frac{1}{2}$ in. thick. A single brilliant band does not exhibit the fine layering detectable even in the brightest of clarain, but is a coherent and uniform whole, brilliantly glossy, indeed vitreous, in its texture. The compact vitreous bands may split up readily in the fingers to small cube-like segments.

Clarain occurs generally as bands of very variable thickness; even when considerably streaked with fusain it has a definite and smooth surface when broken at right-angles to the bedding-plane, and these faces have a pronounced gloss or shine. This surface lustre is seen to be inherently banded, as well as to have bands of fine durain intercalated between its own bands.

Durain occurs generally as bands of very variable thickness. Durain is hard, with a close firm texture, which appears rather granular even to the naked eye. However straight the break across it, the broken face is never truly smooth, but, if looked at closely, always has a finely lumpy or matte surface. Generally, even in the dullest of durain bands, a few (or many) flecks or hair-like streaks of bright coal are to be seen.

Fusain occurs chiefly as patches or wedges. It consists of powdery, readily detachable, somewhat fibrous strands.

In South Yorkshire, durain, or "hards," occurs in comparatively thick bands in many of the seams, so that it may be separated readily for commercial purposes. In the Parkgate Seam, for example (of which a generalized section is given in Fuel Research Survey Paper No. 13, "The Parkgate Seam," London, 1929), a band of fairly pure durain attains a thickness of 13 in. in the Manvers Main area. A second upper durain band a few inches thick is separated from the lower band by over 12 in. of interbanded bright and hard coal. The portion of the seam including this concentration of durain is known as the "hards" or "middle coal."

The top and bottom portions of the seam, consisting chiefly of clarain with some vitrain, are known as the "bright" or "soft" coal. Fusain may be recognized at almost any cleavage-plane parallel to the bedding, and is sometimes found in lenticular masses up to $\frac{1}{2}$ in. in thickness.

The greater hardness of the middle coal causes this to be concentrated in the screened large coal at the colliery, and the comparative friability of the bright coal results in its concentration in the smallest screened size, through $\frac{3}{8}$ in., which is used for coke-making. The most friable ingredient, fusain, is concentrated in the finest dust. This is illustrated by figures for the fusain contents of different fractions in dust screened from the coal before washing.‡

TABLE I.—*Concentration of Fusain in Coal Dust (Manvers Main).*

Size (I.M.M. Mesh).	Weight.	Fusain.
	P.Ct.	P.Ct.
On 20	3·6	..
20– 60	37·6	1
60–100	25·4	5
100–200	10·1	25
Through 200	23·3	70
	100·0	19

The banded ingredients are not entities of distinctive and unvarying composition. As Hickling has pointed out (*Trans. Inst. Min. E.*, 1926-1927, Vol. LXXII., p. 261), clarain varies considerably in lustre and may be subdivided into bright and dull portions; indeed, the lustre of clarain may be so bright as to make its recognition from vitrain difficult, and the duller clarains cannot be readily distinguished from durain. This gradation of appearance doubtless corresponds with a gradation of properties, but it is nevertheless convenient to use the distinctive names vitrain, clarain, and durain, while recognizing that the clarain, in particular, may vary considerably in properties.

For the work described in this paper it was necessary to isolate quantities of the banded ingredients for large-scale coking tests. It was easy to obtain large quantities of clarain and durain, which (by visual examination) were comparatively pure. Fusain was also obtained fairly readily from the colliery screens by hand-picking, but difficulty was experienced in collecting large quantities of vitrain. This banded ingredient is usually firmly attached in narrow bands to clarain and durain, and considerable labour is necessary to chip off the vitrain. It was not found practicable to obtain the 160 lbs. required for a large-scale coking test, but by dint of much labour a quantity of about 15 lbs. was obtained.

The proximate and ultimate analyses of the four banded ingredients isolated from the Parkgate Seam are recorded in Table II.

TABLE II.—*Analysis of the Banded Ingredients of the Parkgate Seam (Manvers Main).*

Proximate (Air-Dried Basis).	Vitrain.	Clarain.	Durain.	Fusain.
	P.Ct.	P.Ct.	P.Ct.	P.Ct.
Moisture	1·8	1·9	1·4	1·7
Volatile matter (*less* moisture)	32·9	35·5	28·3	10·6
Ash	0·7	0·6	3·4	7·6
Fixed carbon	64·6	62·0	66·9	80·1
Volatile matter (*less* moisture) on ash-free dry basis	33·7	36·4	29·7	11·6
Ultimate (Ash-Free Basis).				
Carbon	84·7	84·8	86·2	91·2
Hydrogen	5·4	5·3	5·2	2·9

The very low volatile-matter content of the fusain, its high carbon, and its low hydrogen contents differentiate it sharply from the other banded ingredients. The other banded ingredients are not markedly dissimilar. The volatile-matter content of the clarain is higher than that of vitrain and durain.‖ The carbon content of the durain is higher than that of the vitrain and clarain.

The varying friabilities of vitrain, clarain, and durain (fusain being, of course, so very friable that its comparison with the

* Paper before the Midland Institute of Mining Engineers, Dec. 19. Reproduced by permission of the Institution of Mining Engineers.

† Fuel in Science and Practice, 1923, Vol. II., p. 39.

‡ Coke for Blast Furnaces, London, 1930, p. 191.

‖ The averages of the volatile matter figures (*less* moisture), on the ash-free dry basis, of the banded ingredients of 16 sections of the Parkgate Seam (Fuel Research Survey Paper No. 13) are: Vitrain, 34·2 p.ct.; clarain, 37 p.ct.; and durain, 32·3 p.ct.

other banded ingredients is unnecessary) may be compared by the size analyses of the samples charged in the small-box tests. Even these figures do not adequately show the difference, since the durain required treatment in a stud crusher in addition to two final passages through a Carr type crusher, compared with single treatment in the Carr type crusher for the vitrain and clarain.

TABLE III.—*Comparison of Size Analyses of Crushed Vitrain, Clarain, and Durain.*

Passing Through.	Vitrain.	Clarain.	Durain.
	P.Ct.	P.Ct.	P.Ct.
60 mesh	3	1	0·5
20 ,,	23	12	15
10 ,,	59	44	38
5 ,,	88	79	68
⅛ in.	92	86	77
¼ ,,	98	93	94

Thus, despite no great difference in the amounts passing ¼-in. mesh, vitrain is shown to be the most friable and durain the least.

Certain differences are also to be found in the specific gravities of the banded ingredients. For comparison with the coking slack actually used, the percentages for each banded ingredient floating in liquids of different specific gravity were determined, with the results recorded in Table IV.

TABLE IV.—*Float and Sink Analysis of Banded Ingredients Compared with Coking Slack.*

Material.	Floats, 1·30 S.G.	Floats, 1·35 S.G.	Floats, 1·40 S.G.	Sinks, 1·4 S.G.
Average coking slack	64·5	20·8	6·1	8·6
Vitrain	90	8	2*	..
Clarain	86·8	10·3	2·9*	..
Durain	18·5	68	12	1·5

* Sinks, 1·35 S.G.

Thus 80 p.ct. of the durain is greater than 1·30 S.G., but less than 1·40 S.G., compared with only 10-12 p.ct. for the vitrain and clarain between the same limits. This difference provides a basis for a rough test for determining the proportion of durain occurring in ordinary coking slack.

The behaviour of the banded ingredients on carbonization is marked by greater differences than are shown, for example, by proximate and ultimate analysis. Volatile crucible coke-buttons obtained in the ordinary volatile-matter test (7 minutes heating to 900° C.) were compared with coke-buttons obtained from the different fractions of the Parkgate coking slack obtained by float-and-sink analysis. Vitrain gives the most strongly swollen coke-button, while that obtained from durain is dull and shrunken. Fusain is non-caking and gives an incoherent powder. The fractions from the Parkgate coking slack give shrunken coke-buttons for a specific gravity higher than 1·35. This marked difference in the behaviour in the volatile-matter test has led most writers to conclude that fusain is non-coking and that its presence in a coking slack is deleterious. Some writers have gone farther and considered durain to be non-coking. Lessing, for example (*Fuel*, 1922, Vol. I., p. 138), has said:

"Fusain is . . . non-coking . . . durain is nearly non-coking, while the whole coking principle of coals seems to reside in clarain and vitrain."

The behaviour of the banded ingredients on heating may be conveniently shown by the laboratory coking test described by Mott and Wheeler ("Coke for Blast Furnaces," p. 175).* In this test the coal is subjected to the same rate of heating as obtains in a wide coke-oven—namely, 1° C. rise per minute—and its percentage contraction and expansion under a load of 100 grammes are noted. The results obtained for the four banded ingredients of the Parkgate Seam (Manvers Main) were as follows:

Ingredient.	Vitrain.	Clarain.	Durain.	Fusain.
Contraction, p.ct.	17	16	24	*Nil*
Expansion, ,,	94	91	*Nil*	*Nil*

In this test the vitrain and clarain behave much the same, the contraction and expansion being only slightly greater for vitrain. Fusain is quite inert in the test, giving a product indistinguishable in appearance from the untreated material. Durain contracts but is non-swelling.

* This is an improved apparatus of the type detailed by Bradley and Mott (Trans. Inst. Min. E., 1928-1929, Vol. LXXVI., p. 200).

Small-box Tests.

In the first set of coking tests 15-lb. charges of the hand-picked vitrain, clarain, and durain were carbonized in cubical tins in a coke-oven. The banded ingredients were first crushed to the usual size of coking slack charged to the ovens—namely, 95 p.ct. through ¼-in. mesh.

The vitrain coke had the best external appearance and revealed a most uniform structure. The clarain coke was duller in appearance and had more enlarged pores than the vitrain coke. The durain coke was dull and granular in appearance, while the porous development was quite different from that of the vitrain and clarain coke. The shape of the original coal-pieces was evident in some zones, and some of the pores were probably spaces left between original coal-pieces. The typical durain coke pores (developed inside each original particle) are elongated. It is the swelling power of vitrain and clarain which causes the individual particles to coalesce and lose their identity, the complete blockage of the original free space in the loose coal causing the escaping gas to blow small bubbles which become pores. With durain, a contraction occurs which reduces the percentage of free space and brings many surfaces of the particles together; but the absence of swelling prevents the true coalescence of all the original coal surfaces, so that the gas produced can escape through the network of spaces not filled by the contraction of the coal as a whole, and also through the inter-connected elongated pores in the original coal particles.

It is clear, therefore, that the absence of swelling power of the durain is the chief factor in making durain cokes so different from the vitrain and clarain cokes. An important feature of the vitrain small-box coke was its greater uniformity compared with clarain coke, with smaller sized pores, which (taking the most valuable Welsh and Durham metallurgical cokes as a standard) appear to be desirable. The greater uniformity and smaller pores of the vitrain coke may be related to the greater uniformity in structure (absence of banding, for example) and lower volatile-matter content of the vitrain itself. The fact that vitrain is more friable than clarain would result in its more uniform distribution in a mixture of the banded ingredients occurring in a coking slack. It is therefore conceivable that increase in the vitrain content of a coking slack would improve the quality of the coke.

Large-box Tests.

Subsequent tests were all made in boxes of old washery screen-plate (⅜-in. perforations) made to hold about 160 lbs. of material. The boxes were usually 1 ft. 9 in. long, 1 ft. 5 in. wide, and 1 ft. 5 in. deep. The sides were lined with brown paper to hold the slack, and a perforated-plate cover was wired on. The boxes, when filled, were placed on the sole of an empty oven, and the usual top charge of the oven then added.

When the oven was discharged, the box was recovered, and the coke quenched, weighed, and bagged for transport to the laboratories of the Midland Coke Research Committee, where size analyses and shatter tests were made.

Clarain and Durain.—Two tests were made with both clarain and durain. The raw material was hand-picked and chipped as free as possible from the other banded ingredients. The hand-picked materials were, if necessary, coarsely crushed in a rotary stud crusher, and finely crushed in a small Carr type crusher specially built for experimental work. The size of the materials was such that about 95 p.ct. passed a ¼-in. screen.

TABLE V.—*Average Results of Tests on Clarain and Durain Cokes.*

Coke No.	Description.	P.Ct. of Coke Obtained on—						Shatter Indices.			
		4 In.	3 In.	2 In.	1½ In.	1 In.	½ In.	2 In.	1½ In.	1 In.	½ In.
		P.Ct.									
13S(b)i.	100 Clarain.	30	59	79	89	95	99	49	70	86	96·8
13S(b)ir.	100 Do.	27	57	81	90	95	98	58	77	88	97·2
13Q(b)t.	100 Durain tops	57	75	79	81	81	83	80	83	85	86·3
13Q(b)b.	100 Do. bottoms	41	81	91	95	96	97	86	93	96	97·5
13Q(b)tr.	100 Durain tops	66	76	83	86	88	90	77	83	87	89·6
13Q(b)br.	100 Do. bottoms	52	79	94	96	98	99	73	86	94	96·1

The average results of the size and shatter tests on the clarain and durain cokes are recorded in Table V. The durain coke was divided into two portions, since the coke from the bottom of the box was hard and massive but that from the top was friable. In the first test 60 p.ct. of the massive type of coke ("bottoms") was obtained, but in the second test only 30 p.ct. of bottoms resulted.

The clarain cokes were apparently well "fused," but heavily fissured and much inferior to coke made from ordinary Parkgate coking slack, which gives a shatter index of about 86. The pores are also enlarged.

The durain cokes, as already mentioned, were of two types—a dense hard coke, which gave in one test a 1½-in. shatter index of 93, and a friable coke in which the shape of the original coal particles could be seen. The top portion of the durain coke must be classed as a "freak" coke, its shatter indices in one test—namely, 80, 83, 85, and 86—not showing the proportional increase obtained with a normal coke. The low ½-in. shatter

indices indicate its friable nature. Even the dense bottom coke in the second test was abnormal (½-in. shatter index below 97).

Clarain and Vitrain Blends.—Since it was not possible to isolate sufficient vitrain to use for blending tests, a mixture of clarain and vitrain was obtained by choosing large lumps of the tops and bottoms of the Parkgate Seam and estimating the amount of the banded ingredients present by measuring the width of the bands. For the calculation, the specific gravities of the banded ingredients are assumed to be the same, and the aggregate widths of the different bands were taken as the proportionate amount of the banded ingredient present. Any pieces containing bands of durain or fusain were rejected, so that the pieces used contained vitrain and clarain so far as could be ascertained by microscopic examination. The average vitrain content of 22 large pieces examined was 22 p.ct., the percentage varying from 9 to 38, but in 15 pieces from 15 to 30 p.ct. The large pieces were then crushed and coked in large boxes. The results of the examination of the cokes are recorded in Table VI.

TABLE VI.—*Comparison of Clarain Cokes with Clarain Vitrain Blend Cokes.*

Coke No.	Description.	P.Ct. of Coke on Receipt on			Shatter Indices.			
		4 In.	3 In.	2 In.	2 In.	1½ In.	1 In.	½ In.
13S(b)i. .	100 p.ct. Clarain	30	59	79	49	70	86	96·8
13S(b)ir. .	100 ,, ,,	27	57	81	58	77	88	97·2
	Average .	28	58	80	53	79	87	97·0
13S(b)v. .	Clarain & vitrain	46	72	88	65	79	90	97·6
13S(b)vr.	Mixture . . .	52	68	85	71	82	92	96·8
	Average .	49	70	86	68	80	91	97·1

On comparing these figures, it is seen that a larger sized coke was produced from the clarain and vitrain mixture (crushed Parkgate tops and bottoms). The clarain-vitrain mixture coke was also harder. It was also noted that there was less variation between successive shatter-test results for the clarain-vitrain mixture coke, showing that it was more uniform in composition.

An attempt was made to analyze the material used in the coking tests by means of float-and-sink analyses, with the results recorded in Table VII.

TABLE VII.—*Comparison of Float-and Sink Analyses.*

Coal No.	Material.	P.Ct. by Weight.		
		Floats. 1·3 S.G.	Floats. 1·35 S.G.	Sinks. 1·35 S.G.
13S(b)i. .	Clarain	86·8	10·3	2·9
13S(b)ir. .	,, ...	89·3	8·3	2·4
	,, ...	73·5	15·4	11·1
13S(b)v. .	Tops and bottoms .	81·5	14·8	1·3
13S(b)vr. .	,, ,, ,, .	67·5	18·4	14·1
	Vitrain	90·0	8·0	2·0

It is clear that the float-and-sink analyses of clarain picked from the Parkgate Seam may vary within wide limits and may be indistinguishable from that of vitrain. Float-and-sink analysis cannot, therefore, be used to indicate the amount of vitrain present. On the other hand, the comparatively large percentage of floats of 1·35 S.G. material found in the tops and bottoms may indicate that rather more durain was present than was anticipated from microscopic examination. The results obtained could not therefore be used with confidence to show the effect of vitrain until the effect of blending durain had been established

Blends with Durain.—A portion of the first batch of Parkgate tops and bottoms was blended with 20 p.ct. of Parkgate durain and coked. A portion of the second batch of clarain was also blended with 10 p.ct. of durain, crushed to the normal size for coking, and, in another test, 10 p.ct. of durain was crushed to give 95 p.ct. through 200 mesh. The results are recorded in Table VIII.

TABLE VIII.—*Effect of the Addition of Durain.*

Coke No.	Description.	P.Ct. of Coke on			Shatter Indices			
		4 In.	3 In.	2 In.	2 In.	1½ In.	1 In.	½ In.
13S(b)v. .	Tops and bottoms . . .	46	72	88	65	79	90	97·4
13S(b)vi. .	+ 20 p.ct. durain, ¼ in. .	65	84	92	70	81	91	97·2
13S(b)ir. .	100 p.ct. clarain . . .	27	57	81	58	77	88	97·2
13S(b)xiv. .	+ 10 p.ct. durain, ¼ in. .	52	70	86	60	74	86	96·5
13S(b)xv. .	+ 10 ,, ,, 200 mesh	40	61	82	59	73	86	97·1

In both series of tests the addition of durain increases the size of the coke, while in one series the hardness (1½-in. shatter index) was slightly increased, but in the other series it was lowered. It would not therefore appear that durain has much influence on the coke hardness, and the harder cokes obtained from clarain may be attributed to the influence of the vitrain present.

Blends with Fusain.—It has been established by the Midland Coke Research Committee that the presence of fusain uniformly distributed throughout a coking slack improves the quality of the coke obtained. Results obtained with Yorkshire and Derbyshire coking slacks are recorded in Table IX. (see *Coke for Blast Furnaces*, Tables LXV. and LXXI.).

TABLE IX.—*Effect of Adding Fusain to Coking Slack.*

Coke No.	Description.	P.Ct. of Coke on—			Shatter Indices.	
		4 In.	3 In.	1½ In.	2 In.	1½ In.
29B(b). .	Yorkshire coking slack . .	16	38	86	70	87
29S(b)ii. .	+ 1·5 p.ct. fusain . . .	57	69	86	74	90
29S(b)iii..	+ 3·0 ,, ,, . . .	52	68	86	81	91
22O(b). .	Derbyshire coking slack .	30	55	87	32	85
22P(b)ii. .	+ 1 p.ct. fusain	56	78	95	74	88
22P b)iii..	+ 2 ,, ,, ...	76	82	90	77	88
22P(b)iv..	+ 3 ,, ,, ...	76	89	97	78	90
13H(b). .	Man. Main Parkgate slack .	49	84	95	79	88
13G(b)i. .	+ 0·7 p.ct. fusain . . .	70	83	93	79	88
13G(b)iii.	+ 2·0 ,, ,, . . .	57	86	94	82	90
13G(b)iv..	+ 3·3 ,, ,, . . .	79	89	97	83	91

Similar results were obtained at Manvers Main by blending fusain with clarain. The fusain was hand-picked and ground to pass through 200 mesh (since this is the normal size of fusain in coking slacks). The results of tests on clarain and fusain blend cokes are recorded in Table X.

TABLE X.—*Effect of Fusain Addition.*

Coke No.	Description.	P.Ct. of Coke on—			Shatter Indices.	
		4 In.	3 In.	2 In.	2 In.	1½ In.
13S(b)i. .	100 p.ct. clarain	30	59	79	49	70
13S(b)ii. .	+ 2½ ,, fusain, 200 mesh .	59	73	86	60	75
13S(b)iii..	+ 5 ,, ,, 200 ,, .	52	78	92	69	82
13S(b)iv. .	+ 7½ ,, ,, 200 ,, .	55	74	90	70	82

Thus the addition of not more than 5 p.ct. of fusain of less than 200-mesh size greatly increases the size of the coke and raises its hardness appreciably.

Blending with "Middlings" and "Dirt."—In a coking slack there is present a proportion of "middlings" (S.G., 1·35-1·6) and of "dirt" (over 1·65 S.G.). The middlings are particles of ash content higher than most of the coal, and may be expected to behave somewhat similarly to durain. The middlings were examined by first removing them from Parkgate slack as material sinking at 1·35 S.G., sizing and floating each size in liquids of different specific gravity, as shown in Table XI.

TABLE XI.—*Examination of Middlings and Dirt (Sinks, 1·35 S.G.) from Parkgate Coking Slack.*

Size. (I.M.M. mesh)	Weight, P.Ct.	Floats, 1·4.		Floats, 1·5.		Floats, 1·6.		Sinks, 1·6.	
		Weight, P.Ct	Ash, P.Ct.	Weight, P.Ct.	Ash, P.Ct	Weight, P.Ct.	Ash, P.Ct.	Weight, P.Ct.	Ash, P.Ct.
On 5 . .	25·4	78·6	5·2	13·2	14·0	2·5	23·2	5·7	41·2
5– 10. .	30·9	72·7	4·6	14·2	14·0	4·6	22·7	8·5	50·2
10– 20. .	17·5	68·1	4·2	15·2	12·1	5·0	21·7	11·7	55·5
20– 60. .	14·3	72·3	3·8	11·9	11·4	3·4	20·6	12·4	51·8
10–100. .	4·0								
100–200. .	4·0	62·4	2·7	18·9	5·1	10·3	12·7	8·4	52·8
Through 200	3·9								

The total percentage of sinks of 1·35 S.G. in washed Parkgate coking slack is about 15; of this only 1·5 p.ct. is sinks of 1·60 S.G. (or dirt) and 13·5 p.ct. middlings (floats, 1·35-1·6 S.G.). About three-quarters of the middlings float at 1·4 S.G. A visual examination of the middlings separated showed that the floats portion of 1·4 S.G. on 5 mesh was mostly durain, but with decreasing size the percentage of bright coal increased. The results of visual examination were confirmed by determining the percentage expansion of the different sizes of floats of 1·4 S.G. of the middlings in the laboratory coking test (the original

fractions being first ground to the same size for test). The results were as follows:

—	Size. (I.M.M. mesh)	Expansion, P.Ct.
Middlings: sinks, 1·35 S.G.; floats, 1·4 S.G. .	On 5	8
,, ,, ,, ,, ,, ,, .	10	15
,, ,, ,, ,, ,, ,, .	20	21
,, ,, ,, ,, ,, ,, .	60	31

Since durain gives no expansion and clarain gives 91 p.ct., these figures confirm that durain is concentrated in the coarser sizes.

By floating large quantities of slack in calcium-chloride solution of the required specific gravity, the slack was divided into floats of 1·35 S.G. and sinks of 1·35 S.G. (middlings and dirt). Some floats of 1·35 S.G. were coked separately, and in another test twice the normal amount of sinks of 1·35 S.G. were mixed with floats of 1·35 S.G. to show the effect of increasing the amount of middlings. Finally portions of the floats of 1·35 and sinks of 1·35 S.G. were coked separately in a small-box test. The results of the examination of the large-box test cokes are recorded in Table XII.

TABLE XII.—*Effect of the Addition of Middlings.*

Coke No.	Description.	P.Ct. of Coke on			Shatter Indices.	
		4 In.	3 in.	2 In.	2 In.	1¼ In.
13S(b)ix. .	Parkgate slack	66	80	92	75	85
13S(b)vii. .	Slack floats of 1·35 S.G. .	57	78	91	80	90
13S(b)viii. .	Floats of 1·35 S.G. + twice normal sinks of 1·35 S.G.	88	92	94	75	85

These results showed that an increase in the amount of middlings increased in size of the coke (as did the addition of durain), but did not affect its hardness. On the other hand, the removal of the middlings and dirt did not affect the size of the coke, but increased its hardness appreciably. This result is probably due to the increase in the percentage of vitrain.

The effect of progressively removing middlings from Parkgate slack was also shown by the laboratory coking test, when the effect on the percentage expansion was as follows:

Material.	Expansion, P.Ct.
Parkgate slack	72
,, ,, floats, 1·4 S.G.	84
,, ,, ,, 1·35 ,, ...	85
,, ,, ,, 1·30 ,, ...	96

The small-box cokes for sinks of 1·35 S.G. gave a structure resembling that of durain.

Doubling the amount of middlings normally present in Parkgate slack had no effect on the coke hardness, but their complete removal resulted in a much harder coke being obtained. It should be noted that an attempt to confirm this result was not successful, but an inferior batch of crushed Parkgate slack was used, and its flotation on a large scale presents many difficulties. Further tests are being made to attempt to confirm the results reported.

In order to show the effect of dirt, 10 p.ct. of shaly refuse (all through a ¼-in. mesh) from the re-wash box of a Baum washer was added to Parkgate tops and bottoms. The results of the examination of the coke are recorded in Table XIII.

TABLE XIII.—*Effect of the Addition of Dirt.*

Coke No.	Description.	P.Ct. of Coke on			Shatter Indices.			
		4 In.	3 In.	2 In.	2 In.	1½ In.	1 In.	½ In.
13S(b)v. .	Tops and bottoms. . .	46	72	88	65	79	90	97·4
13S(b)x. .	+ 10 p.ct. of dirt . . .	81	88	93	63	73	87	96

The coke was increased in size, but the hardness was considerably reduced; the low ½-in. shatter index also indicates that the coke was abradable. The presence of dirt in a coking slack is therefore shown to be deleterious.

SUMMARY.

The experimental results so far obtained show that different samples of clarain, which forms the largest percentage of the banded ingredients present in a coking slack, may vary considerably in their coking properties, but yield a comparatively poor coke that is much fissured and breaks easily. Although it has not yet proved possible to show the effect of vitrain by definite blending experiments, the evidence available suggests that it is proportionately more valuable than clarain in a coking slack. Durain, although so different in its coking properties from vitrain and clarain, appears to exert little effect when present in a coking slack. Fusain although itself non-coking, has been shown to be valuable when uniformly admixed with the remainder of the coking slack and when present to an extent not exceeding about 5 p.ct. An increase in the amount of middlings (floats, 1·35-1·6 S.G.) does not have any beneficial effect, and there is an indication from the tests so far made that their complete removal may be advantageous. More evidence is, however, necessary to establish this point. The presence of free dirt (sinks, 1·6 S.G.) is deleterious to the quality of the coke obtained.

PRACTICAL APPLICATIONS.

It is not easy to increase the percentage of vitrain in a coking slack, but since the friability of vitrain will probably lead to its concentration in smaller sizes (slack compared with nuts, for example), this may be a contributory factor in the known better quality of coke obtained from slack than from crushed large coal and from clean slurry compared with slack. Regarding coke hardness as being of primary importance, it would appear to be advantageous to screen out the coking slack at as small a maximum size as possible to increase the percentage of vitrain present.

Fusain would appear to be even more important than vitrain, and, if possible, high volatile coal should be treated to conserve the fusain for use in the coking slack. In a screening plant much fusain is lost in the fine dust, and in a washery much of it floats on the surface of the wash-box and settling-tank, being then obtained in a form in which it cannot be uniformly admixed with the rest of the coal. The remedy is to screen out the smallest sizes of dust before washing, and, if possible, collect the dust produced during screening. The dry dust, rich in fusain, may then be added in definite proportions to the coking slack and uniformly admixed.

Other experimental work has been carried out in connection with the use of fusain substitutes with the object of improving coke hardness, and, since it does not come within the scope of this paper, will form the subject of another communication.

In conclusion, I wish to thank Mr. F. J. Finn (Manvers Main Collieries), Mr. R. A. Mott, and the staff of the Midland Coke Research Committee, who have rendered me valued assistance.

Wales and Monmouthshire Junior Gas Association

Members of this Association held their third meeting of the session at Neath on Saturday, Dec. 13. Early in the afternoon, members visited the Neath Corporation Gas-Works, Mill Lands, Neath, where they were met by Mr. Clark Jackson, Engineer and Manager, who conducted the party over the plant. Since the last visit of the Association, new plant has been installed, which includes a "Dri-Gas" and naphthalene washing plant; and the latter aroused much interest among those present.

Later, in the Council Chamber, Gwyn Hall, Neath, a meeting was held, at which the Mayor of Neath (Councillor W. J. Challacombe) was present, supported by the Deputy-Mayor (Councillor J. R. Jones) and Alderman John Davies.

The MAYOR extended a hearty welcome to the Association to the ancient Borough of Neath; and the PRESIDENT (Mr. C. H. Collins), on behalf of the Association, thanked the Mayor.

Mr. R. T. Mills (Cardiff) then read a paper on "Some Experiences in Fixing Gas Appliances."

EXPERIENCES IN FIXING GAS APPLIANCES.

By R. T. MILLS, of Cardiff.

In the fixing of a gas fire, the first consideration must necessarily be to dispose successfully of the products of combustion. This presents little or no difficulty where you have a fireplace in the room, and a good natural draught to the chimney is assured. To ascertain this, a test can be made by lighting a piece of paper and holding it underneath the canopy of the grate. Fireplaces could be placed under three headings:

1. Good natural draught.
2. Sluggish.
3. Back-draught.

In respect of No. 1, this fireplace would be suitable for almost any gas fire. As to No. 2, I would avoid fixing inset fires, but I have found that fires of the injector type, with Solex burner, often surmount the difficulty, and are quite

satisfactory in use. If, however, any trouble should be experienced with this type of fire, it can generally be overcome by taking the flue from the fire as far up the chimney as possible, with open end, so that the velocity of flow may be maintained. Another method employed is to fill-in the grate with sheet iron, cutting a hole for the flue and injector ventilator, so that the maximum benefit may be attained. Grates can, of course, be filled in with oxidized copper, silver, or brass surrounds, &c.; and this makes a very artistic finish in keeping with any special finished fire selected for the room. When fixing a frame fire in front of a register grate, it has been found advantageous to take off the register and substitute a metal plate, as this improves the appearance considerably.

Down-Draught.

To remedy any trouble in this connection, I would recommend the fixing of a piece of flue, together with a cowl on the top of the chimney. In certain districts, it was my experience to visit houses and bungalows where the builder had only provided a chimney in one room. In the other rooms where gas fires had been fitted the products of combustion were allowed to discharge into the cavity wall, and, indeed, in some cases the flue was just fixed into the brickwork. In cases of this description it would appear that the architects concerned thought more of saving a few pounds in the building of their houses than of the people's health. No time however was lost in drawing attention to this matter, and I am pleased to say that numerous orders were secured to supply and fit asbestos cement flues to the gas fires mentioned. In places where this work has been carried out, consumers have been extremely satisfied with the results. Several architects have been induced to install "Nautilus" flues, which, of course, effect substantial saving in chimney breast space, bricks and mortar, and labour. In rooms having no proper chimneys or flues, some difficulty is experienced by the fact that each job requires a different flue lead from the fire.

It is customary to keep flues as far inside the room as practicable, in order that as much heat as possible is extracted from the flue before it passes through the wall to discharge the products of combustion. In the case of bungalows it is advisable to keep the flue cowl 2 ft. 6 in. to 3 ft. above the eaves. When installing fires in houses on the ground floor, it is advisable to keep the flue inside as far as possible, taking it through the wall below the ceiling level, and bearing in mind the weather conditions likely to be encountered. A flat cowl is sometimes fixed on an outside wall, but in cases where such cowls have been installed in certain positions they have proved unsatisfactory in use. A great deal depends upon the position and exposure to weather conditions. With regard to the open-end type of flue, discharging through a flat roof, it is essential, for satisfactory working, to fit the flue flush with the roof.

I should like to mention a case I was called upon to investigate. A fire was required for a bedroom containing a fire-grate with mantle complete and raised breastwork, which on first appearances looked very suitable for a gas fire. Noticing, however, that there was no stack outside, I went into the roof space and discovered that the flue terminated flush with the ceiling. When I drew attention to this, the consumer appeared to be very surprised to discover that there no proper chimney was provided. However, it was found that satisfactory results were obtained in this particular case by providing a flue which was carried through the slate roof, making good with a lead slate. I have always considered it best to run the flue pipe on a rise, avoiding, if possible, any awkward bends and sharp angles. As hot air follows the least line of resistance, it is advisable to fix flue pipes on the ascension.

Fixing and Maintenance.

Little difficulty is encountered when fixing a fire on the ground floor, when there is a cellar beneath. In running the gas supply in houses having tiled halls or blocked floors, an iron pipe can be driven underneath the tiles (providing there is plenty of depth) from the meter box to a convenient point inside the room. The pipe should be of ½ in. diameter, and it is advisable in these cases to provide a syphon under the floor. Care should be exercised, however, when carrying out this work to keep clear of a water pipe.

Another method I would suggest is to run the pipe from the room above, down between the moulding of the door. This, when stained over, looks like a beading and makes a neat job. In houses where there is a cupboard handy, the pipe can be taken inside, through the shelves to the bottom, and continuing under the floor of the room. With regard to the fixing of gas fires in new houses, if it is possible to obtain access before the tiles in the fireplace are laid, a piece of 1¼-in. iron can be run with elbow attached underneath before the concrete is laid for the hearth. This will allow the fire to be fixed quite conveniently, and the connections will be out of sight. The brass tube with ½-in. elbow will pass through the iron pipe and the connection to a recess cock under the floor. For nurseries and bedrooms where there are children it is advisable to provide a cock with a loose key, to ensure the utmost safety.

A tube back should not be fitted on a block on the floor, or on the skirting, as this method looks very unsightly. When running pipes down the wall of a room, it is advisable to keep the pipe behind the picture rail and skirting. This will allow the pipe to be let into the plaster when the room is next decorated.

The Geyser.

For general utility and quick service, water heating by means of a geyser is quite a satisfactory and reliable proposition. I consider that the geyser should receive far more consideration than it does at the moment. There are one or two points in connection with the installation of the geyser which I should like to emphasize. The carrying away of the products of combustion should be the foremost consideration. An outlet to the open air or a chimney flue is a necessity, and a cowl should always be fixed on the outside flue, and, inside, a baffler. Even when this has been done, I have found cases where the products of combustion have been prevalent in the bathroom, and naturally I have had to look farther than the flue outlet for the cause. The size of the burners may be found to be the source of the trouble, and in one or two instances burners have had to be changed before satisfactory combustion has been obtained.

In the past, before there was any real co-operation with the builders of houses, the size of piping was more or less left to the plumber on the job, who did not give any consideration to the possibility of a geyser being fitted. Thus the main supply pipe in many cases was found to be totally inadequate. This meant that in practically nine cases out of ten a new pipe direct from the meter was required. This, of course, considerably adds to the cost of fixing. Again, in some instances, the pipe has had to be run on the face, which looks somewhat unsightly.

All geysers should be fitted with safety interlocking taps of an automatic valve which makes it impossible to have the gas turned on unless water is passing through the geyser. A geyser capable of delivering 2 gallons of water per minute at 100° Fahr. will consume anything up to 110 c.ft. per hour.

Points in Fixing.

The size of the service pipe should not be less than 1 in. diameter, and one of the first matters requiring attention should be the size of the meter, which should not be less than a No. 4 Standard, capable of passing gas at the rate of 120 c.ft. per hour. I have known cases where the main water pressure fluctuates, and also where a second conveniently situated tap has been brought into use, thereby robbing the supply to the geyser, with the risk of serious damage. Under these conditions, and where head of water will admit, safety lies in making independent and direct connection to the cold water storage cistern.

Care should be taken to keep the spout of the geyser as near as practicable to the bath, in order to reduce the heat losses as much as possible. The gas supply pipe should be at least ⅝ in. in diameter. It is necessary to fix a full-way cock to the gas supply pipe; also it is advisable to fix a water stop tap in the bathroom, to control the supply of water to the geyser.

The diameter of the condensation pipe should not be less than ½ in., and this should be led into the bath waste, and not into the trap of the lavatory basin. If, however, it is found necessary to do this, the joint should be made at the top of the trap.

With regard to the composition of the flue, I venture to suggest Urastone as being the best material.

The flue from the geyser should be carried into the existing chimney wherever possible. Failing this, it should be run outside and taken up at least 2 ft. above the eaves, terminating with a cowl. I have found by experience that the Roventa cowl or the Brassington cowl is suitable for this purpose.

In houses where there is an existing hot water supply from the back boiler, and this is giving poor service, the installation of a circulator will not improve matters unless the most common faults are rectified. I will enumerate two:

1. Flow pipe terminating too low in the hot storage tank or cylinder. To obtain good results, this should be not lower than 12 in. from the top of the cylinder.
2. The return pipe into the tank or cylinder.

It is important that the cold water should be delivered horizontally, and in order to achieve this, a side connection is made to the tank close to the bottom.

If the circulating pipe is found to run round the room, and enclosed in a box, it is advisable to have the front removed to ascertain if there is a sag in the pipe, as time and labour will be saved later on if there happens to be any trouble from this cause. Where there is a tank system, a cylinder should be advised, and fitted near the position selected for the circulator. The old pipe can be altered with very little trouble. Assuming that the range boiler is required to work in conjunction with the gas boiler, proceed to carry out the work by cutting circulating pipes in the scullery below all branches, and then turn them into the cylinder in their proper positions.

With the cylinder system, select a good position for the boiler, where it will be in sight and under full control, keeping it as near to the cylinder as possible. Provide a strong bracket to hold the boiler, keeping it well up in order to get a short flow and return. Where possible, go straight into the cylinder with

flow and return pipes, and thus obviate inter-circulation. I would recommend the lagging of the pipes and cylinder. Further, it is necessary to take the hot supply from the expansion pipe. To prevent the possibility of sagging, it is wise to provide a board for supporting the circulating pipe when it is run horizontally.

This is a point worth mentioning in connection with the vent pipe, which should be arranged in order that it will not spill the water after being heated. It is advisable, therefore, to carry this pipe at least 15 in. above the level of the water in the cold feed.

Central Heating.

In conclusion, I would like to mention central heating system installations employing large gas-heated boilers. Several of these systems are installed in Cardiff at the present time, but there is scope for expansion in this direction in places such as shops, offices, workrooms, small factories, &c. An ordinary circulating boiler, consuming about 50 c.ft. of gas per hour, from which a few radiators can be supplied makes an ideal arrangement at a cost very little in excess of separate gas-heated units, and the maintenance cost of such an installation is small. I have discovered in practice that a boiler of the size mentioned will heat four 8-loop 32-in. radiators and 80 ft. of circulating pipes, and will maintain an average temperature of 60° Fahr. within a space of 4800 c.ft. I consider this method of gas heating to be very flexible, as by fitting a valve to each radiator the temperature can be governed and controlled as desired.

Discussion.

Mr. C. H. Collins, referring to gas fires, said that the author had not mentioned the case of chimneys having excessive up-cast. He would like to hear the author's views on this subject. Referring to the taking-off of the register of the grate, he thought that the appearance could be improved by filling in with art metal.

Mr. W. Clark Jackson (Neath) said the paper was one which contained important matters which should claim the attention of everyone. He fully endorsed the author's remarks with regard to closing-in of the grate with material to harmonize with the room. Examples of this could be seen at the local showroom of the Neath Corporation, which he hoped members would take the opportunity of visiting. He said there was no doubt that the gas industry would have to look to the water heating load for its expansion. Mr. Jackson mentioned the immersion heater, which he found to be a very satisfactory appliance. He thought it was necessary to carry out a maintenance system, particularly in regard to fires. This was done in his district, commencing in early September. Every fire was put in order and made ready for use before the winter set in.

Mr. J. W. Hearson (Pontardawe) agreed with the author in regard to the Brassington cowl. He had found this type to be efficient. In cases of down-draught, he found that often this was due to the chimney being set lower than the surrounding chimneys; and by making the chimney higher the trouble had been eliminated. He also stated that it was very important when attending to gas fires to see that the fuel exactly fitted over the burner orifices.

Mr. C. S. Thane (Newport) asked Mr. Mills to explain the method of running an iron pipe under the tiles. Was there not a possibility of some of the débris getting into the pipe when being driven underneath?

Mr. T. Walrond (Cardiff) thought that it was time that local authorities insisted upon proper and adequate flues by providing a chimney, as much trouble had been experienced, particularly in some of the housing schemes he had in mind, where flues had been let into the cavity wall. He also stressed the importance of replacing wherever possible defective flues of geysers, as these were a source of danger.

Mr. E. E. Moore (Swansea) emphasized that a gas fire was not a remedy for a bad chimney. To overcome down-draught, he had found it a good plan to fix a " flower pot " on top of the chimney. He also referred to the condensation pipe of the geyser. He agreed this should be ½ in. in diameter, as the trouble with a smaller pipe was that it became locked before the condensation was trapped.

Mr. R. T. Mills suggested that, to overcome excessive up-cast, it was a good idea to fix a piece of sheet iron above the register, with a flue taken from it, and then to take a flue from the fire. The flue, of course, would be broken when it met the sheet iron. Replying to Mr. Thane, he explained that a ¾-in. iron pipe was driven under the tiles, and then a ½-in. pipe was inserted afterwards. Referring to the Brassington cowl, he would like to point out that this could be adjusted according to the weather conditions. A special wire gauze was also provided to obviate the possibility of birds' nests.

By the kindness of Mr. Clark Jackson, tea was provided for members at the Castle Hotel, and subsequently votes of thanks were accorded to Mr. Mills and the Neath Corporation Gas Committee, the former being proposed by the Vice-President (Mr. S. E. Brett) and the latter by the President.

Humidity Control in Dry Purification

The following extract is from the Report of the American Gas Association Sub-Committee on Humidity Control in Dry Purification:

EXPERIENCES AT WEST CONSHOHOCKEN.

By N. S. Logan, of the Philadelphia Electric Co.

Revivification *in situ* has been practised at the West Conshohocken Plant since the latter part of 1926. Back-pressure troubles were soon experienced, and upon opening the boxes the oxide was found to be very dry and hard. Removal of oxide from service was normally necessitated by back pressure and not by inefficiency or inactivity of the sponge.

Late in 1927 experiments in introducing moisture were made by spraying water from a hose into the top of the box during the normal revivification period. Considerable increase in activity resulted, and back-pressure rise was somewhat retarded.

Early in 1928 all purifier boxes were equipped with water beaders immediately above the upper bed, and sufficient spray nozzles to cover the entire area of the sponge.

The theory of operation is as follows:

1. Fresh sponge as mixed and used at the plant contains about 35 p.ct. of moisture and the object of the treatment is to maintain this condition at all times.

2. The relative humidity of the gas leaving each box will furnish the best indication of the moisture content of the sponge, and will determine the time and rate for introduction of water.

3. Introduction of water will be required only in boxes showing a temperature rise, normally the first box in line, and the fall in temperature through the rest of the series will ensure the deposition of sufficient moisture to maintain the proper condition throughout—that is, a saturated gas at all points.

Calculations were made to determine the amount of water necessary to replace that lost by the oxide in the first box in line due to the temperature rise. This amount was used in the early experiments, but was soon doubled since a large quantity of the water ran through the oxide and out to the seal pot.

The original plan was to spray this predetermined amount into the first box continuously, during both the fouling and the revivifying periods. This method, while showing the best activity results, had the drawback of rapid increase in back pressure, and the difficulty of covering the box area with a small quantity of water. Next, spraying was done only during the time of revivification *in situ*, when the path of the gases and water was in the same direction, ensuring further saturation better distributed. Thus, in our case, the first box in line was revivified every other day for eight hours, and sufficient water introduced during that period to replace moisture removed during the previous fouling time. (Eight hours' revivifying time to 40 hours' fouling time.) This system, while somewhat inferior to the continuous system as regards activity, greatly retarded back-pressure rise, and was adopted.

A comparison of purification results for the past three years is shown in the following table:

—	1927.	1928.	1929.
Lbs. H_2S removed per bushel of oxide	19·8	24·8	23·1
1000 c.ft. of gas purified	2,342,000	3,690,000	4,211,062
Average H_2S grs. per 100 c.ft.	400	380	340
Oxide mixture lbs. per bushel	28	28	20
P.ct. dilution air	4·65	2·9	3·5

An increase of efficiency of 25·25 p.ct. was accomplished in 1928 by the introduction of moisture over the 1927 figures. The decrease in sulphur removal during 1929 was caused by overloading of the purification system, and by a reduction in ore content in the mixed sponge to combat back pressure.

Although activity and life have been increased by the introduction of moisture, the oxide does not yet contain sufficient moisture when removed. It is imperative to keep the sponge moist at all times, otherwise it reaches a state when water sprayed on, and trickling down, runs off the oxide like water from a duck's back. Some work has been done in flooding the box with water and then allowing the sponge to soak before running the water out. Two boxes have been so treated at this time, and, although the results are very encouraging, the possibilities of channelling or washing the ore from the shavings are still before us.

Description of Plant.

During the time covered by the results tabulated above, the purification system consisted of four 25 ft. diameter by 16 ft. high boxes each containing 5000 bushels of sponge, and four 30 ft. by 16 ft. containing 7500 bushels each. Normally but three boxes in each series were in service, in parallel. The last, clean, box was used only during revivification of the first box in line. One revivification blower serves both series, each series was " blown " on alternate days.

Scottish Junior Gas Association (Eastern District)

The "Dri-Gas" Plant at St. Andrews

Thirty members of the Association visited the Gas-Works of the St. Andrews Gas Company on Saturday, Dec. 6. Mr. George Bruce, Engineer and Manager, conducted the visitors over the Works. Particular attention was given to the "Dri-Gas" plant which has recently been installed, and Mr. Morris explained the various points.

The visitors were then taken to the showroom which is situated in the centre of the town. By the kindness of the Directors of the St. Andrews Gas Company, the members were afterwards entertained at tea in the Victoria Restaurant.

Mr. BRUCE, in welcoming the Association, said he was in the happy position of having very progressive Directors. The Gas-Works were fairly old with the exception of the "Dri-Gas" plant, which was the only one of its type completed in Scotland. He thought the time had come when junior members attending these meetings should have their expenses paid. The young members of the industry brought new ideas, and he thought they should be encouraged. He stated that during the five years their showroom had been open, appliances to the value of £2100 had been sold. He believed in co-operation with local plumbers and also co-operation with the Electricity Department.

Mr. D. YULE (Alloa), the President, expressed thanks to Mr. Bruce on behalf of the visitors for the welcome they had received. He considered the suggestion made regarding meeting expenses of the juniors an excellent one, as the benefit to be derived was mutual to the industry and juniors.

Mr. A. Morris, of the St. Andrews Gas Company, was then called to read a short paper on the "Dri-Gas" plant.

THE "DRI-GAS" PLANT AT ST. ANDREWS.

By A. MORRIS, of the St. Andrews Gas Company.

We had been experiencing serious trouble due to deposits, principally of naphthalene, which occurred on the works and at all parts of the district. In particular, we knew that the inlet holder main, which is some 200 yards in length, was causing a big increase in pressure owing to such deposits. The situation was considered with careful regard for the economic side, and it was decided to install a plant combining the operations of dehydration and naphthalene extraction of the gas.

The advantages of dehydration of the gas, where the main object is to eliminate the obstructions and blockages due to deposits of naphthalene, are twofold. First, the efficiency of the naphthalene extraction process is greatly increased, and the extraction requires a smaller quantity of oil than when the gas is saturated, as is normally the case. Secondly, the deposits of naphthalene in mains and services are moist when saturated gas is distributed, and as a consequence are not so readily picked up and cleared away by a naphthalene-free gas.

The plant at the St. Andrews works was supplied by Messrs. W. C. Holmes & Co., Ltd., of Huddersfield, and installed in an old storehouse on the works, situated about 30 yards from the purifiers, and 200 yards from the holder. It consists of a brush washer with two units, each of six washing chambers driven by a steam engine situated between them. The gas is dried in the first unit of the washer, through which it passes, and the naphthalene is extracted from it in the second. The gas drying operation is carried out by a solution of calcium chloride which is continuously circulated through the washer by means of a pump driven from the engine gearing. This pump withdraws the chloride solution from a storage tank, and forces it through a cooler to a small overhead feed tank, from which it flows through the washer. Weakened by the water it has extracted from the gas, the solution overflows from the washer and returns to the tank. From the overhead feed tank, a small supply, about 5 p.ct. or less of the volume circulated, is led to the evaporator, where the water extracted from the gas is evaporated into the air.

COOLER AND EVAPORATOR.

The cooler consists of a rack of horizontal galvanized steel tubes, fitted with cast-iron end headers. The chloride solution enters at the bottom and flows upwards through the tubes in zig-zag fashion. The supply of cooling water is distributed over the outside of the tubes, by means of a trough at the top.

The evaporator consists of cast-iron pipes arranged to form a rack, over the outside of which the solution fed to it descends as it becomes concentrated. The exhaust steam from the washer engine passes through the pipes and provides all the heat necessary to do the evaporation required. The solution is kept at a constant strength, varying between 72° and 80° Twaddell, depending on the time of the year. To do this, the flow of solution over the evaporator is adjusted once a day, and the effect of altering gas-make and temperatures is thereby automatically allowed for. It may be mentioned here that if too high a solution strength for its temperature is maintained, there is danger of solidification taking place. This, however, is easily avoided by keeping the strength to correspond with the prevailing temperature—*i.e.*, in winter the lowest and in summer the highest strength is kept.

The provision of a cooler is necessitated by the fact that the absorption of water vapour involves change of state from the gaseous to the liquid, which is, of course, accompanied by the liberation of latent heat of vaporization. When the gas drying plant is situated, as in our case, at the inlet of the holder, it is necessary to cover the surface of the water inside the holder with a film of oil to prevent the gas becoming saturated again. Before putting the plant into operation, therefore, a quantity of gas-oil, calculated to form a ½-in. film, was pumped into the holder. The dry condition of the interior of the holder, together with the presence of oil, is ideal for its preservation from corrosion, so that further advantages are gained.

The dryness of the gas is expressed as a dew-point, which is the temperature to which it must be cooled before it begins to deposit moisture. Taking as an example figures actually obtained on our plant, the gas enters at a temperature of 56° and leaves with a dew-point of 30° Fahr. The moisture contents are respectively 5·02 and 1·81 grains per c.ft., which represents a removal of 63·9 p.ct. The possible dew-point to be obtained can be calculated from the specific gravity and temperature of the solution pumped to the washer, by aid of a chart supplied by the makers. The determination of the dew-point obtained is made by means of a "wet and dry bulb" hygrometer, through which the gas is passed. The difference between the wet bulb and the dry bulb thermometer readings in this instrument is used to find the dew-point of the gas.

The operation of the naphthalene washing unit is on the usual lines. The quantity of oil pumped into the washer is, however, only 10 gallons per million c.ft. of gas. The oil enters at the gas outlet end, and the used oil overflows at the gas inlet end. The spent oil is used in our C.W.G. plant. Following the treatment of drying and removal of naphthalene, the gas is measured in a "Connersville" station meter, which is housed in the same building.

IMPROVED CONDITIONS.

The conditions in the distribution system have rapidly improved. After a few days' operation the holder drips ceased to give the usual 4 gallons of water daily, and have since become dry. Following upon this, the drips on the district also all become dry. After about a month I found the dew-point on the district to be 37° Fahr. with gas of 35° dew-point leaving the works. There is now very little difference in dew-point, between the gas leaving the works and on the district. At several works where the gas is dried, it was found that some of the syphons did not dry up. This is due to water from the ground getting in through a fractured main. In this way faults in the mains can be detected and located with much greater ease.

The greatest benefit to be obtained from distributing dry gas is, of course, the prevention of corrosion in the mains and services and the elimination of stoppages due to water and rust.

Discussion.

Mr. J. M. Dow (Perth) asked if they were not troubled with a gummy deposit with a film of oil on the inside of the holder, and if any of the oil inside the holder had drifted to the lutes.

Mr. MORRIS said that they had no trouble of this kind, but it had to be remembered that the plant had only been in operation a short time.

Mr. GARRIE (Burntisland) asked what type of oil was used and the approximate cost. How was the wet bulb of the hydrometer kept wet?

Mr. MORRIS replied that the oil was ordinary gas-oil supplied by the Shell Mex Company, and the price 4½d. per gallon. The gas after passing the dry bulb thermometer reached the wet bulb thermometer to which was attached a damp piece of linen which was kept wet by a small quantity of water in a specially constructed drip box so that the linen was always in contact with the water.

Mr. HENDERSON (Dundee) inquired whether they were not now troubled with dry dust being carried forward to the services since distributing dry gas.

Mr. MORRIS: We have had no trouble of this kind.

Mr. WHITE (Dundee) inquired if the valves of the meters were inclined to stick with distributing dry gas.

Mr. MORRIS: We have had no trouble with meters; in fact, since the installation of the "Dri-Gas" plant there has been an appreciably drop in meter replacements.

Mr. GARRIE (Burntisland) wondered if there had been a loss of luminosity when the oil film inside the holder was first operated.

Mr. MORRIS said there was no loss of luminosity of the gas at all, and this was all the more noticeable, as the work of pumping the oil into the holder was only completed before lighting-up time.

Mr. BRUCE (St. Andrews) said that the plant so far had come up to expectations, and that a distinct falling-off was noticeable with regard to complaints, also meter repairs were greatly reduced for the period they had been operating the "Dri-Gas" plant.

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

The Stock Exchange was in holiday mood during the three days of business last week, and the number of transactions recorded was small. The only feature of note occurred before the close on Wednesday when a sharp rise took place in gilt-edged securities. This was mainly attributable to the reduction in the New York Bank Rate. British Funds, headed by 4 p.ct. Consols, were particularly active, and prices appreciated in consequence.

The Gas Section was no exception to the general rule, and the volume of business was almost negligible. Where comparable, prices of the few transactions were at about the previous week's rates, and the only change in quotation was that of Wandsworth ordinary, which gained 1 point to 109-114. It will be observed from the Stock and Share List that a parcel of Colonial Gas Association 8 p.ct. £1 preference shares, which rarely come into the market, changed hands at 19s. 7½d. At this price, the yield is £8 3s. p.ct. The Association owns or controls 28 gas undertakings in the Commonwealth of Australia, and the ordinary capital issued consists of 609,204 ordinary shares and 296,053 preference shares. The latest issue of preference shares for cash was in February, 1928, at £1 1s. 6d. per share to shareholders in the proportion of one preference for every 12 preference shares held. These shares are entitled to a non-cumulative dividend of 8 p.ct. (payable in April and October) and to priority for capital. The preference dividend, which was originally 6 p.ct., was increased to 7 p.ct. in December, 1916, and to 8 p.ct. as from July 1, 1924.

Current Sales of Gas Products.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Dec.* 29.

The values of tar products remain unchanged and are as follows:

Pitch, 45s. per ton f.o.b.

Creosote, for export, 5⅝d. to 6d. per gallon f.o.b.

Pure toluole, about 2s. per gallon; pure benzole, about 1s. 8d. per gallon; 95/160 solvent naphtha, about 1s. 5d. per gallon; pyridine bases, about 3s. 9d. per gallon.

All prices of spirits are *ex* sellers' works.

Tar Products in the Provinces.

Dec. 29.

The average prices of gas-works products during the week were: Gas-works tar, 19s. 3d. to 23s. 3d. Pitch—East Coast, 44s. to 45s. f.o.b. West Coast, Manchester, Liverpool, Clyde, 44s. to 45s. f.o.b.* Toluole, naked, North, 1s. 6¾d. to 1s. 7¼d. Coal-tar crude naphtha, in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 1s. 2¼d. to 1s. 3d. Heavy naphtha, North, 11d. to 1s. Creosote, in bulk, North, liquid and salty, 3¼d. to 3⅜d.; low gravity, 1⅛d.; Scotland, 3⅛d. to 3⅜d. Heavy oils, in bulk, North, 5⅛d. to 6d. Carbolic acid, 60's, 1s. 2d. to 1s. 2¼d. Naphthalene, £10 to £12. Salts, £3 to £5, bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port, it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Dec.* 27.

Market conditions in this area are without alteration. While inquiries continue quite numerous, orders are scarce and stocks remain high.

Pitch.—There is very little new business being placed. Export price is nominal at 42s. 6d. to 45s. per ton f.o.b. Glasgow, and home price is about 42s. 6d. per ton *ex* works.

Refined tar to Ministry of Transport Specification. Competition is keen for any orders on the market. Value is slightly lower at 2¾d. to 3d. per gallon f.o.r. naked, according to quantity required.

Creosote.—Trading is dull. B.E.S.A. Specification is 2⅞d. to 3⅛d. per gallon; low gravity, 3d. to 3⅛d. per gallon; and neutral oil, 3d. to 3¼d. per gallon—all *ex* makers' works in bulk.

Cresylic.—Quotations are unchanged, but few orders are being placed. Pale, 97/99 p.ct. is 1s. 6d. to 1s. 7d. per gallon; dark, 97/99 p.ct., 1s. 5d. to 1s. 6d. per gallon; and pale, 99/100 p.ct., 1s. 8d. to 1s. 9d. per gallon—all f.o.r. works.

Crude naphtha.—Value is steady at 4d. to 4¼d. per gallon. Production is low at present.

Solvent naphtha.—90/160 grade is in moderate request at 1s. 2¾d. to 1s. 3d. per gallon, but 90/190 remains nominal at 1s. to 1s. 0¾d. per gallon.

Motor benzole.—Only small orders are being received, and value is easy at 1s. 4d. to 1s. 4¼d. per gallon in bulk *ex* makers' works.

Pyridines are unchanged. 90/160 is nominal at 3s. to 3s. 3d. per gallon.

Benzole Prices.

The following are considered to be the market prices at the present time:

	s. d.	s. d.	
Crude benzole	0 7½ to	0 8½	per gallon at works
Motor ,, ...	1 3 ,,	1 4	,, ,, ,,
Pure ,, ...	1 7½ ,,	1 8½	,, ,, ,,

Contracts Advertised To-Day.

Coal.

The Malvern Urban District Council invite tenders for the supply of gas coal. [Advert. on p. 976.]

Hot Water Heating Schemes.

The Smethwick Education Committee invite tenders for hot water heating. [Advert. on p. 976.]

Trade Notes.

Blackman Air and Gas Instruments.

A folder recently issued by the Blackman Export Company, Ltd., of 374, Euston Road, London, N.W. 1, deals with the firm's air and gas instruments. Among the various instruments described are Blackman psychrometers, portable pressure and depression testing sets, wall fixing manometers, pitot tubes, and different types of thermometers.

Diaries, Calendars, &c., Received.

Acknowledgment is made of the receipt from the following friends of seasonable gifts in the form of diaries, calendars, &c.:

W. G. Beaumont & Son, Priory Works, Bow, London, E.
Cambrian Wagon Company, Ltd., East Moors Road, Cardiff.
Thomas Duxbury & Co., 16, Deansgate, Manchester.
Gibbons Bros., Dudley, Ltd., and Gibbons (Dudley), Ltd.
William Guppy & Son, Ltd., 2 and 3, Eldon Street, London, E.C.
R. & A. Main, Ltd., London and Falkirk.

Parliamentary Intelligence.

[From Our Special Correspondents.]

House of Lords.

Special Orders.

The following Special Orders, having been passed by the Special Orders Committee, were approved by the House: Sheppey, Broadstairs, Little Hulton, Maidstone, Derby, and St. Helens.

House of Commons.

Special Orders.

The following Special Orders have been approved by the House: Sheppey, Broadstairs, Little Hulton, Maidstone, Derby, and St. Helens.

Legal Intelligence

Assets of Windermere Gas Undertaking.

Mr. Justice Bennett, in the Chancery Division on Dec. 18, gave his considered judgment with reference to the question of the distribution of the surplus assets, amounting to over £23,000 net, of the Windermere and District Gas and Water Company, which has been taken over by the Windermere Urban District Council.

Giving judgment, Mr. Justice Bennett said there was a contest between the preference shareholders and the ordinary shareholders. He had come to the conclusion that the preference shareholders were not entitled to participate in the distribution of the surplus assets. Further, that after the expenses of the winding up had been paid, the surplus sales and undistributed assets would be subject to distribution among all the ordinary shareholders of the Company.

The costs of that summons, added his Lordship, would be taxed and paid as part of the costs of the winding-up proceedings.

STOCK AND SHARE LIST.

[For Stock Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Dec. 24.	Rise or Fall on Week.	Transact'ns Lowest and Highest Prices During the Week.
£			% p.a.	% p.a.				
171,978	Stk.	Aug. 14	5	5	Aldershot 5 p.c. max. C. .	73—78	..	..
822,992	,,	,,	4	4	Do. 4 p.c. Pref. . .	73—76	..	..
1,551,868	,,	Oct. 9	7⅞	7⅞	Alliance & Dublin Ord. . .	100—105	..	..
374,000	,,	July 10	4	4	Do. 4 p.c. Deb. . .	72—77	..	..
522,655	,,	Aug. 28	7	7	Barnet Ord. 7 p.c.	108—111	..	..
300,000	1	Oct. 23	1/4½	1/7½	Bombay, Ltd.	15/6 17/6	..	16/7½
174,500	10	Aug. 14	9	9	Bournemouth 5 p.c. . . .	14½—15½	..	14½—15½
500,050	10	,,	7	7	Do. 5 7 p.c. . .	12½—13	..	12½—12⅝
439,160	10	,,	6	6	Do. Pref. 6 p.c. .	1[illegible]—11½	..	..
50,000	Stk.	Dec. 18	3	3	Do. 3 p.c. Deb. .	57—60*	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb. .	75—78*	..	..
357,900	,,	Aug. 28	7½	7½	Brighton & Hove 6 p.c. Con.	112—117	..	..
871,880	,,	,,	6½	6½	Do. 5 p.c. Con.	102—105	..	..
1,287,500	,,	July 24	5	5	Bristol 5 p.c. max.	93—94*a*	..	..
855,000	,,	Sept. 25	8	7	British Ord.	108—113	..	..
100,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref. . . .	109—114*	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. . .	74—77*	..	..
450 000	,,	,,	5	5	Do. 5 p.c. Red. Deb. . .	95—98*	..	..
100,000	,,	June 26	5	5	Cambridge 5 p.c. Deb. . .	97—100	..	..
100,000	10	Dec. 4	10	6	Cape Town, Ltd.	8⅜—9⅜	..	..
100,000	10	Nov. 6	4½	4½	Do. 4½ p.c. Pref. . .	6½—7½	..	..
150,000	Stk.	Dec. 18	4½	4½	Do. 4½ p.c. Deb. . .	70—75*	..	..
626,860	,,	July 24	6	6	Cardiff Con. Ord.	95—98	..	..
287,860	,,	June 26	7½	7½	Do. 7½ p.c. Red. Deb. .	99—103	..	..
157,150	,,	Aug. 14	5½	5	Chester 5 p.c. Ord.	86—91*b*	..	..
98,986	1	Oct. 9	†2/-	†2/-	Colombo, Ltd. Ord.	32/—34/-	..	..
24,500	1	,,	1/4½	1/4½	Do. 7 p.c. Pref. . .	18/—20/-	..	..
609,204	1	Oct. 9	1/9½	1/4½	Colonial Gas Assn. Ld. Ord	16/6—18/6	..	..
295,053	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	18/—20/-	..	19/7½
2,078,280	Stk.	July 24	7	6	Commercial Ord.	95—98	..	..
475,000	,,	Dec. 18	3	3	Do. 3 p.c. Deb. . .	57—60*	..	..
787,560	,,	Aug. 14	7	7	Croydon sliding scale. . .	106—109	..	..
453,100	,,	,,	5	5	Do. max. div. . . .	83—86	..	..
842,270	,,	Aug. 14	10	7	Derby Con.	115—125*a*	..	..
55,000	,,	Dec. 18	4	4	Do. Deb.	65—70*a**	..	..
209.000	,,	Aug. 28	5	5	East Hull Ord. 5 p.c. . .	72—75	..	..
1,002,180	,,	Sept. 25	†7*g*	†4	European, Ltd.	100—110	..	100½—102
18,629,125	,,	July 24	5⅝	5⅝	Gas Light & Coke 4 p.c. Ord.	19/6—20/-*f*	..	19/6—19/9
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max. . . .	63½—65½	..	64—65
4,157.020	,,	,,	4	4	Do. 4 p.c. Con. Pref. . .	79—84	..	80½—82
5,602,620	,,	Dec. 18	3	3	Do. 3 p.c. Con. Deb. . .	60—63*	..	61½—62½
3,542,770	,,	,,	5	5	Do. 5 p.c. Red Deb. . .	99—102*	..	100⅝
161,4•0	,,	Sept. 11	10	10	Harrogate Cons. 10 p.c. max.	155—160	..	..
82,500	,,	Aug. 28	7	7	Hastings & St. L. 5 p.c. Conv.	98—103	..	..
258,740	,,	,,	5½	5½	Do. 3½ p.c. Con v.	79—84	..	..
70,000	10	Oct. 9	½	10	Hongkong & China, Ltd. .	13—14	..	..
213,200	Stk.	Aug. 14	6	6	Hornsey Con. 3½ p.c. . . .	88—91	..	..
2,436,594	,,	Nov. 6	25	15	Imperial Continental Gas . .	335—355	..	340—345
223,180	,,	Aug. 14	8½	8½	Do. 8½ p.c. Red. Deb.	80—85	..	..
285,242	,,	Aug. 14	8½	8½	Lea Bridge 5 p.c. Ord. . .	123—128	..	..
2,145,907	,,	Aug. 14	6	6	Liverpool 5 p.c. Ord. . . .	96—97*b*	..	..
600,000	,,	Sept. 25	7	7	Do. 7 p.c. Red. Pref. .	99—101*b*	..	..
165,736	,,	Aug. 28	8	9	Maidstone 5 p.c. Cap. . .	123—128	..	..
68,480	,,	Dec. 18	3	3	Do. 3 p.c. Deb. . .	54—57*	..	..
75,000	£5	Dec. 4	†10	†10	Malta & Mediterranean . .	5½—5⅞	..	..
392,000	—	Oct. 1	5½	5½	Melrop'itan (of Melbourne) 5½ p.c. Red. Deb. . . .	88—91	..	..
675,000	Stk.	Nov. 20	†8	†6	Montevideo, Ltd.	100—110	..	100
2,061,315	,,	July 24	5⅛	5	Newcastle & Gateshead Con.	16/9—17/3*df*	..	..
682.856	,,	,,	4	4	Do. 4 p.c. Pref. .	72—73*d*	..	..
691,705	,,	June 26	3½	3½	Do. 3½ p.c. Deb. .	66½—67½*d*	..	..
169,940	,,	Aug. 28	7½	7½	North Middlesex 6 p.c. Con.	115—120	..	..
396,160	,,	Aug. 14	5	5	Northampton 5 p.c. max. .	76—81	..	..
300,000	,,	Nov. 20	7	9	Oriental, Ltd.	104—109	..	105½
60,000	£5	18 My., '15	—	—	Ottoman	0—¼	..	..
205,152	Stk.	Dec. 18	8	8	Plym'th & Stonehouse 5 p.c.	107 112*	..	..
424,416	,,	Aug. 28	8	8	Portsm'th Con. Stk. 4 p.c. Std	115—120*	..	..
241,446	,,	,,	5	5	Do. 5 p.c. max. . .	80—83	..	..
186,000	100	Dec. 1	4	4	Primitiva 4 p.c. Red. Deb. .	97—100	..	..
677,837	Stk.	July 24	4	4	Do. 4 p.c. Red. Deb. 1911	83—86	..	..
371,496	,,	Dec. 18	4	4	Do. 4 p.c. Cons. Deb. .	83—86*	..	..
150,000	10	Sept. 25	6	6	San Paulo 6 p.c. Pref. . .	8¼—8⅝	..	..
1,736,968	Stk.	Aug. 28	6½	6½	Sheffield Cons.	105—107*e*	..	..
95,000	,,	July 10	4	4	Do. 4 p.c. Deb.	76—78*e*	..	..
90,000	10	June 5	†4	‡5	South African	4—6	..	..
6,709.895	Stk.	Aug. 14	7½	5	South Met. Ord.	104—108	..	104⅝—105½
500,000	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	112—115	..	..
1,895,445	,,	July 10	3	3	Do. 3 p.c. Deb. . .	60—63	..	..
734,000	,,	Sept 11	6½	6½	Do. 6½ p.c. Red. Db.	99—102	..	..
91,500	,,	Aug. 14	8½	8½	South Shields Con. . . .	108—110*d*	..	..
1,543,795	,,	July 24	6½	6½	South Suburban Ord. 5 p.c.	102—105	..	..
468,837	,,	Dec. 18	5	5	Do. 5 p.c. Deb.	98—101*	..	101½
647,740	,,	Aug. 28	5	5	Southampton Ord. 5 p.c.max.	75—78	..	..
121,275	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	76—78*	..	..
179,014	,,	July 24	8	8	Sutton Ord.	115—120	..	..
94,500	,,	June 26	5	5	Do. 5 p.c. Deb. . . .	96—99	..	..
250,000	,,	Aug. 28	7	7	Swansea 7 p.c. Red. Pref. .	98—101	..	..
200,000	,,	Dec. 18	6½	6½	Do. 6½ p.c. Red. Deb. .	100—103*	..	..
1,076,490	,,	July 24	6⅝	6⅝	Tottenham District Ord. .	103—107	..	..
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref. . .	98—101	..	..
199,005	,,	Dec. 18	4	4	Do. 4 p.c. Deb. . .	76—79*	..	..
182,380	10	30 Dec., '12	—	—	Tuscan, Ltd.	2—3	..	..
85,701	Stk.	Sept. 25	6	6	Do. 6 p.c. Red. Deb.	14—79	..	..
809,094	,,	Aug. 28	7	7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	95—100	..	..
88,330	,,	,,	5	5	Do. 5 p.c. pref. . .	88—93	..	89½
1,180,970	,,	July 10	—	7	Wandsworth, Wimbledon, and Epsom Cons. . .	109—114	+1	..
200,000	,,	,,	5	5	Do. 5 p.c. Pref. . . .	96—98	..	..
488,344	,,	Dec. 18	5	5	Do. 5 p.c. Deb. . . .	97—100*	..	..

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of Stock. *g.*—Paid on £10 shares. * Ex. div. † Paid free of income-tax. ‡ For year. § Div.=10 p.ct. p.a. less tax and less tax on interim dividend.

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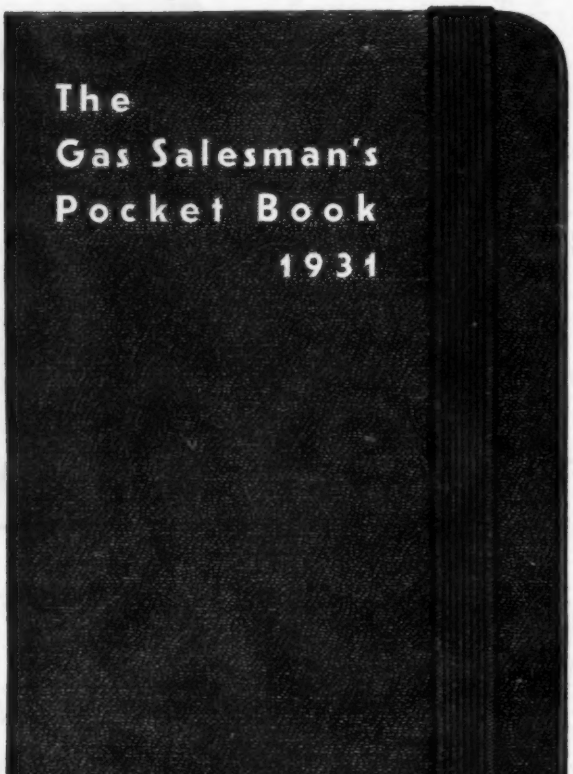
First Impression Sold — Second in the Press

The Gas Salesman's Pocket Book, 1931.

REVISED TO DATE. REDUCED IN SIZE.

Edited and compiled by

Norman S. Smith, B.Sc., Assoc.M.Inst.Gas E.



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The approximate consumptions of every gas appliance with which you deal, and the comparative costs as against equivalent electrical equipment.

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Vol. 192. 82nd Year. | LONDON, DECEMBER 31, 1930. | No. 3528. Price 1s.

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PALMERSTON HOUSE, LONDON, E.C. 2

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METERS
Alder & Mackay Ltd
Established 1870
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GENUINE PUDDLED
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A HIGHLY CONCENTRATED TAR ACID EMULSION,
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GAS EXHAUSTING PLANTS
in capacities from 100 to 750,000 cubic feet per hour.

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of positive type, for industrial purposes.

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Horizontal and Vertical.

RATEAU TURBO GAS EXHAUSTERS, BLOWERS, and FANS
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for reducing any inlet pressure up to 40 lbs. down to ordinary district pressure.

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for detecting gas leaks and for road ventilation.

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LIGHT . HEAT . POWER . BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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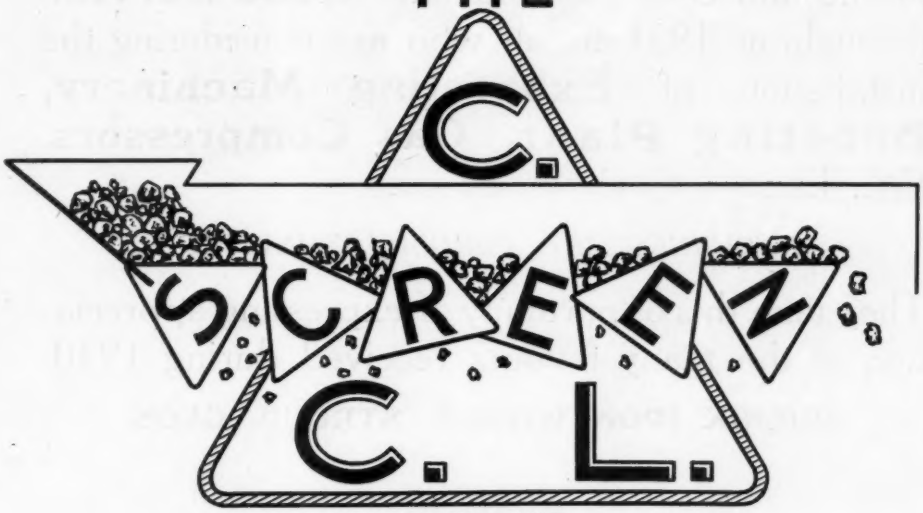

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PENNIES—SIXPENCES—SHILLINGS

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NEW SERIES

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WITH MANTLES IN ALIGNMENT AND BURNERS ALUMINISED TO PREVENT CORROSION.

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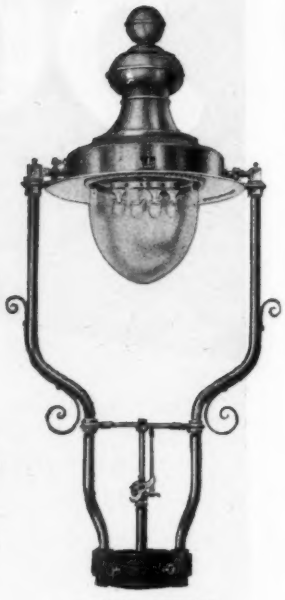

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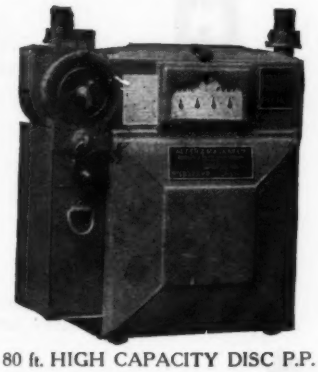

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The speed at which a gas meter should be run is a matter of opinion, but the important factor is the **Capacity per revolution.**

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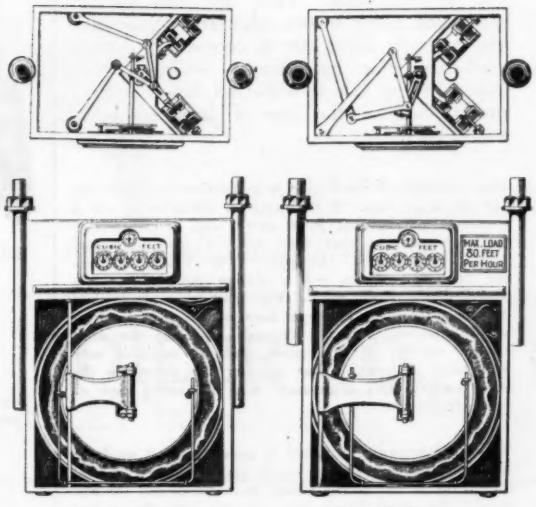

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CAP. P. REV. ·166 C.FT.

80 ft. H.C.
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Established 1850

EDINBURGH, LONDON, and BRANCHES.

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Services and other small diameter pipe

A small trouble that is difficult to reach is more annoying and expensive than the failure of a major unit which is easier of access. The corrosion of services or other pipe of small diameter may prove as costly as the deterioration of street mains or the larger distribution lines.

Services, branching out from the street main, are usually laid under curbing, sidewalks, roads, walls, lawns and other forms of permanent construction where access for reconditioning or replacement is not only a considerable expense to the gas or water company, but a source of disturbance and annoyance to the consumer.

Services, moreover, are frequently laid in proximity to electric lines where stray currents lead to electrolysis. They are also laid in streets and alleys where ashes and refuse give rise to a more rapid rate of corrosion. As this small-sized pipe has thinner walls to start with, it is less able to withstand these corrosive attacks than in the case of larger, heavier-walled lines.

The protection of small pipe is as necessary as with any pipe of larger size. It is, therefore, desirable to use a protective coating that is, in every way, as dependable and permanent as that used for the most important mains. "Bitumastic" Enamel—"The Proven Protection for Pipe Lines"—has, during more than forty years, shown itself to be the most dependable and economical coating for pipe lines of every size. Part of its economy, however, depends on using the most efficient method of application, and, as methods vary with sizes of pipes, it was necessary to determine the most practical and economical way of coating pipe of small diameter.

While "Bitumastic" Enamel is usually spread on large sized pipe by means of a brush, canvas sling or special rolling rig, it has proved more economical and efficient to dip the small sized pipe directly into the molten enamel. We have, therefore, developed a system of dipping utilizing plugs, tongs and easily constructed dipping troughs—which is used with great success by leading gas companies, and which has made the protection of small diameter pipe as simple and as inexpensive in application as it is beneficial and long-lasting in results.

Our new folder C. 180 *gives full details of this new and more economical method of coating—we shall be glad to send you a copy post free on request.*

Sole Makers of "Bitumastic":—

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T-H

Unbreakable Resistances

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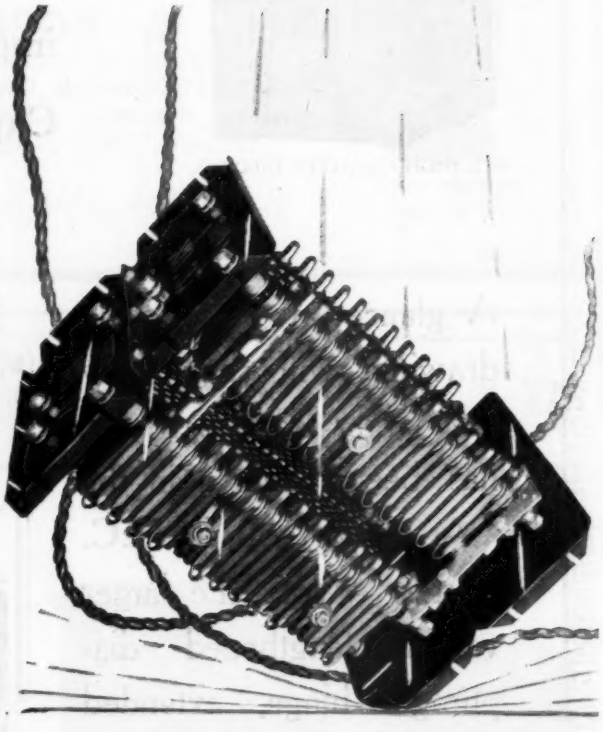

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So states a customer, and, while such treatment is not recommended, it affords a concrete example of the ability of B.T.H. Unbreakable Resistances to withstand the most onerous conditions of service.

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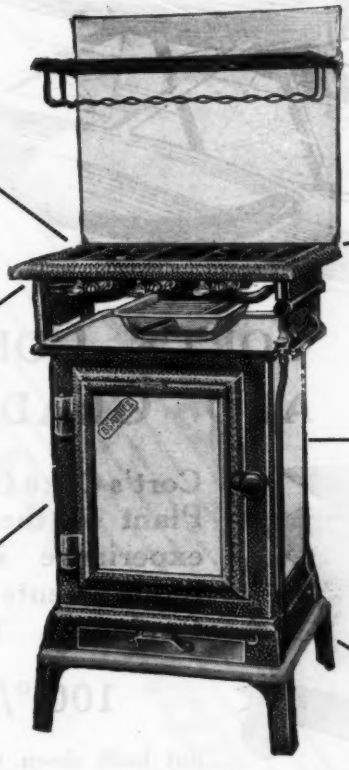

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All Enamel Finish and absence of sharp corners or inaccessible recesses means EASY CLEANING.

Oven Burners removed and replaced without difficulty!!

OUR REPRESENTATIVE WILL CALL WITH SAMPLE FOR INSPECTION.

Sole Selling Agents in Great Britain and Ireland for Gas Cookers manufactured by Messrs. John Harper & Company Limited.

ECONOMIC GAS BOILER CO., LTD.

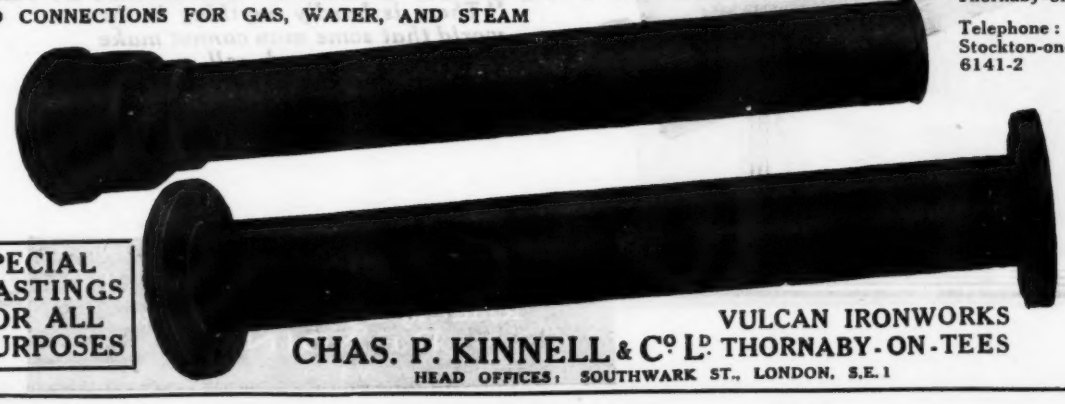
GUY STREET, GANNOW TOP, BURNLEY *Telephone:* 3305 Burnley. *Telegrams:* Bluboilers, Burnley.

KINNELL'S CAST IRON PIPES

AND CONNECTIONS FOR GAS, WATER, AND STEAM

Telegrams: Kinnell, Thornaby-on-Tees

Telephone: Stockton-on-Tees 6141-2



SPECIAL CASTINGS FOR ALL PURPOSES

VULCAN IRONWORKS

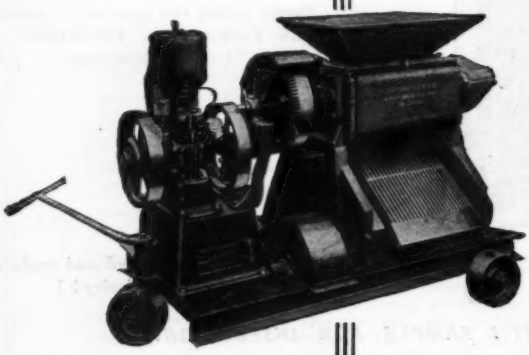
CHAS. P. KINNELL & Co Ld. THORNABY-ON-TEES

HEAD OFFICES: SOUTHWARK ST., LONDON, S.E.1

Supremacy

FLYING OFFICER H. R. D. WAGHORN IN SUPERMARINE ROLLS-ROYCE S.6. WINNER OF THE SCHNEIDER TROPHY CONTEST, 1929.

CORT'S COKE CUTTING AND GRADING PLANT

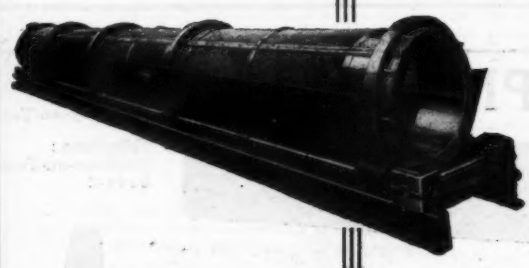


Cort's Coke Cutting and Grading Plant is the outcome of long experience in supplying the requirements of discriminating Engineers. It is

100 °/₀ VALUE,

not built down to a price, but designed rather to create a standard of quality above competition.

Special attention has been given to the countering of the abrasive and corrosive action of coke wherever it is in contact; thus ensuring the maximum of service at the minimum of Cost for upkeep over long uninterrupted periods.



We appeal to Engineers considering the installation of Coke Handling Plant to bear in mind the foregoing points—and it may be opportune to quote John Ruskin :—

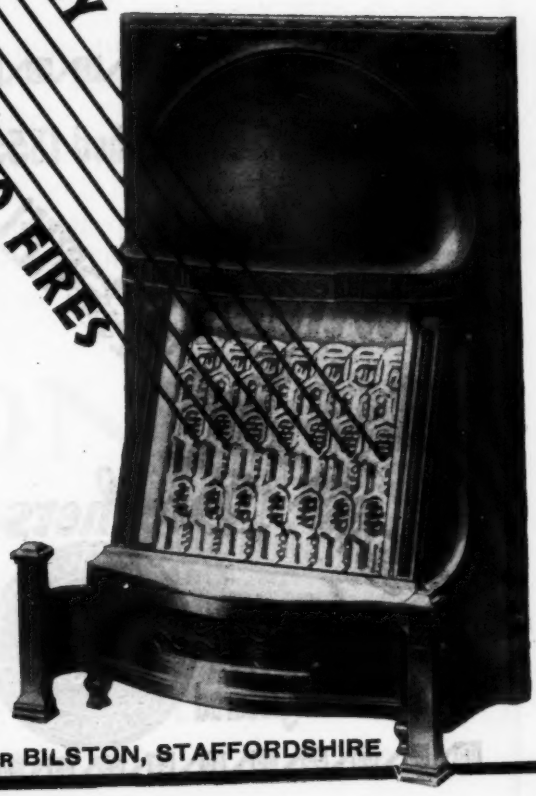
"There is hardly anything in the world that some man cannot make a little worse and sell a little cheaper, and the people who consider price only are this man's lawful prey."

ROBERT CORT & SON, LTD.
Reading Bridge Iron Works
READING

Agents for North of England: Messrs. ROBT. BOWRAN & CO., LTD., 4, St. Nicholas Buildings, Newcastle-on-Tyne

CANNON

VITAGLO RADIANTS ARE EXCLUSIVELY FITTED TO CANNON INCLINED FIRES



CANNON IRON FOUNDRIES, LTD., DEEPFIELDS, NEAR BILSTON, STAFFORDSHIRE

FANS

FOR ALL PURPOSES

Ventilating Plants
Fume Exhausting Plants
Forced and Induced
Draft Plants

BRADLEY & BURCH, Ltd.
Engineers and Contractors
5, Whittington Avenue, London, E.C. 3
— AND —
IMPERIAL WORKS, ILFORD

REGISTERED TELEGRAPHIC ADDRESS
STRINGER
West Bromwich

Established 1855.

Stringer S.B. STEEL

S.B. IRON Brothers.

RAILWAY
ALBION
LM&S Ry
STATION

Trade Marks Registered

KEMPTON'S
Lamps
for
Public Lighting.

The
"London" Circular
Street Lantern
(17 in. size).

The lamp which gives minimum shadow consistent with strength. British made. Thoroughly Storm proof. Many thousands in use.

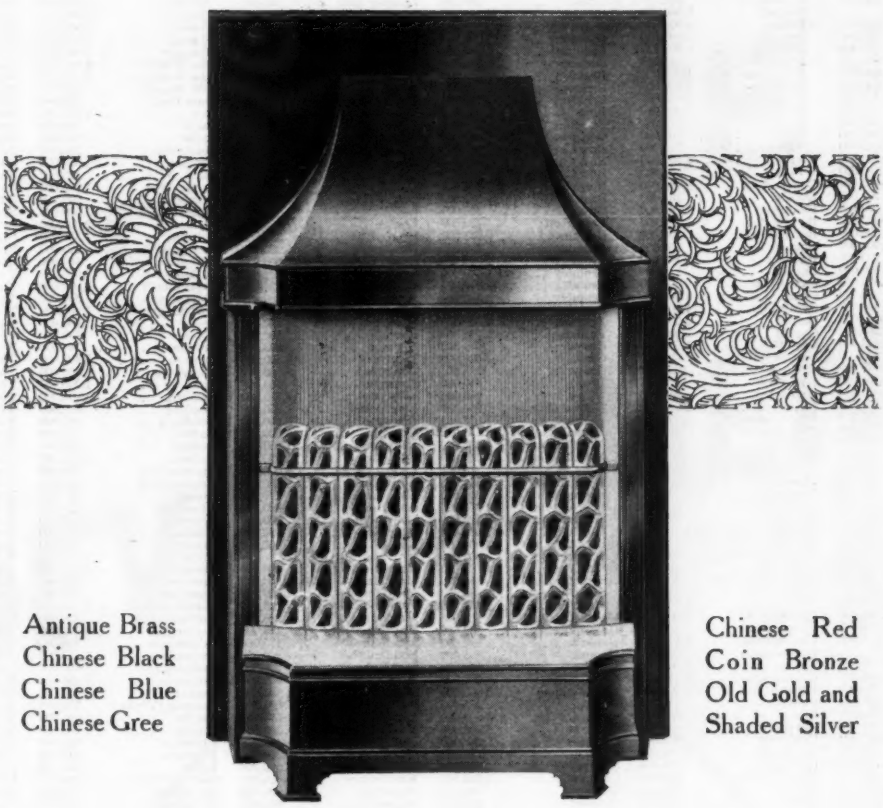
Can also be supplied with one, two or three separate angle burners, as illustrated; or for use with "swan-neck" or other upright sets.

Have you seen our Comprehensive Catalogue?

"KEMTO"
TRADE MARK.

C. H. KEMPTON & Co., LTD.
STANGATE HOUSE,
WESTMINSTER BRIDGE ROAD,
LONDON, S.E. 1.
Telephones: HOP 3743, 5535, 2267

A DAVIS MASTERPIECE



Antique Brass
Chinese Black
Chinese Blue
Chinese Gree

Chinese Red
Coin Bronze
Old Gold and
Shaded Silver

FEW gas fire designs can hope to rival the Davis 'Antony' in popularity, because of its essential fitness for general use. The special finishes named above have extended this usefulness in a way that will appeal to both Public and Gas Undertaking. The Chinese lacquer effect finish is pleasing and modern. The finishes offered satisfy the most exacting requirements.

'ANTONY'

GAS FIRE

with "Beam" (Trade Mark) Radiants.

The ***DAVIS GAS STOVE CO., LTD.***

60, Oxford St., London, W.1. *Works:* ***LUTON.***

(Radiation Ltd., Proprietors)

HUMPHREYS & GLASGOW, LTD.

WATER-GAS

	Cu. Ft. Daily
Aarhus	800,000
Abertillery	500,000
Abertillery	100,000
Admiralty:	
British	800,000
British	800,000
British	800,000
British	800,000
British	800,000
French	800,000
French	800,000
Agram	200,000
Airdrie	430,000
Aldershot	1,400,000
Aldershot	1,000,000
Aldershot	1,316,000
Algiers	1,760,000
Alkmaar	400,000
Allenstein	200,000
Alost	700,000
Amersfoort	300,000
Amsterdam	1,000,000
Amsterdam	1,000,000
Amsterdam	2,700,000
Amsterdam	1,350,000
Antwerp	1,500,000
Antwerp	1,000,000
Antwerp	1,500,000
Antwerp	1,900,000
Arundel	215,000
Ascot	425,000
Ashford	250,000
Augsburg	425,000
Aylesbury	150,000
Aylesbury	470,000
Banbury	200,000
Banff	125,000
Barmen	500,000
Barnsley	588,000
Barrow	300,000
Barrow	500,000
Barry	500,000
Barry	720,000
Bath	1,000,000
Bath	1,000,000
Bath	1,300,000
Bath	1,200,000
Bedford	1,000,000
Belfast	1,700,000
Belfast	4,500,000
Belfast	1,250,000
Belfast	1,250,000
Belfast	2,250,000
Benrath	125,000
Berkhampstead	259,000
Berlin:	
Charlottenb'g	2,500,000
Danziger Str.	1,600,000
Neukoelin	650,000
Neukoelin	700,000
Schmargendorf	760,000
Tegel	3,500,000
Tegel	6,350,000
Tegel	245,000
Berne, Switz.	725,000
Bexhill	400,000
Bideford	258,000
Bilston	375,000
Bilston	125,000
Birmingham:	
Adderley St.	675,000
Adderley St.	850,000
Nechells	3,000,000
Nechells	3,000,000
Nechells	3,000,000
Nechells	7,650,000
Swan Village	1,500,000
Windsor St.	3,000,000
Windsor St.	3,000,000
Windsor St.	6,100,000
Bishop's Stortford	200,000
Bishop's Stortford	300,000
Bishop's Stortford	300,000
Bishop's Stortford	300,000
Blackburn	1,190,000
Blantyre	150,000
Blois	125,000
Blois	125,000
Bochum	530,000
Bognor	100,000
Bognor	423,000
Bognor	500,000
Bo'ness	125,000
Boulogne	340,000
Bournemouth	1,000,000
Bournemouth	500,000
Bournemouth	1,500,000
Bournemouth	1,000,000
Bournemouth	500,000
Bournemouth	1,533,000
Bournemouth	2,000,000
Bournemouth	500,000
Bournemouth	2,750,000
Bradford	1,260,000
Bremen	550,000
Bremen	950,000
Bremen	850,000
Brentwood	250,000
Brescia	588,000
Brescia	588,000
Brest	550,000
Bridgwater	200,000
Bridlington	150,000
Bridlington	200,000
Bridlington	550,000
Brieg	100,000
Brierley Hill	250,000
Brierley Hill	425,000
Brighton	1,750,000
Brighton	1,850,000
Brighton	750,000
Brighton	2,750,000
Brighton	3,000,000
Bristol	2,000,000
Bristol	2,500,000
Bristol	825,000
Bristol	825,000
Bromley	1,500,000
Bruges	200,000
Bruges	600,000

	Cu. Ft. Daily
Brussels:	
Anderlecht	350,000
Anderlecht	350,000
Forest	1,000,000
Forest	1,000,000
Forest	1,000,000
Forest	1,500,000
Forest	88,000
Koekelberg	1,000,000
St. Gilles	1,000,000
St. Josse	1,000,000
St. Josse	600,000
St. Josse	775,000
Ville	750,000
Ville	750,000
Ville	1,500,000
Ville	350,000
Bucarest	1,100,000
Buckie	164,000
Budapest	50,000
Budapest	1,750,000
Budapest	200,000
Budapest	250,000
Burnley	1,350,000
Caen	250,000
Cambridge	500,000
Cambridge	1,000,000
Cambridge	1,700,000
Cardiff	2,000,000
Cardiff	3,000,000
Cardiff	1,950,000
Cardiff	600,000
Carlisle	600,000
Carlsruhe	500,000
Carnarvon	248,000
Charleroi	1,250,000
Châteauroux	125,000
Châteauroux	125,000
Châtelet	500,000
Chester	564,000
Chesterfield	430,000
Chesterfield	90,000
Chesterton	197,000
Chichester	250,000
Chorley	300,000
Cie. des Compteurs	1,150,000
Cie. Lorraine de Ch.	210,000
Cie. Mines de Roche	585,000
Coatbridge	400,000
Commercial, L'n	850,000
Commercial	850,000
Commercial	1,250,000
Commercial	2,000,000
Commercial	800,000
Commercial	2,100,000
Copenhagen	700,000
Copenhagen	2,300,000
Copenhagen	1,750,000
Copenhagen	1,200,000
Courtrai	250,000
Coventry	600,000
Coventry	600,000
Coventry	800,000
Coventry	1,250,000
Coventry	350,000
Gloucester	420,000
Cracow	200,000
Cracow	200,000
Cranleigh	188,000
Crefeld	500,000
Crewe	700,000
Crewe	800,000
Crosfield & Sons	1,500,000
Crosfield & Sons	1,350,000
Crowborough	150,000
Croydon	1,250,000
Croydon	625,000
Croydon	625,000
Croydon	550,000
Croydon	650,000
Croydon	1,125,000
Croydon	150,000
Croydon	3,000,000
Croydon	6,000,000
Deal	250,000
Deal	250,000
Debreczin	100,000
Derby	1,500,000
Derby	2,000,000
Deventer	150,000
Deventer	200,000
Devonport	1,600,000
Devonport	1,100,000
Doncaster	1,350,000
Dorking	150,000
Dorking	300,000
Dorking	130,000
Dover	500,000
Dublin	2,000,000
Dublin	2,000,000
Dublin	650,000
Dudley	600,000
Dundee	1,500,000
Dundee	1,650,000
Dunedin, N.Z.	150,000
Dunedin	275,000
Durham	300,000
Dusseldorf	1,000,000
Eastbourne	1,250,000
Eastbourne	1,550,000
Edinburgh	2,000,000
Eindhoven	1,500,000
Electro-Chimie	650,000
Enschede	282,000
Epping	500,000
Epsom	225,000
Epsom	350,000
Essen	1,400,000
Essen-Borbeck	1,400,000
Exeter	1,100,000
Exeter	1,200,000
Exmouth	376,000
Falmouth	150,000
Falmouth	200,000
Faversham	200,000
Flensburg	300,000
Flensburg	125,000
Fond. del Pignone	164,000
Forst	300,000
Frankenthal	175,000

	Cu. Ft. Daily
Fuel Research Wks.	500,000
Fuel Research Wks.	500,000
Furnes	500,000
Gablonz	140,000
Gas L. & C. Co.:	
Beckton	10,000,000
Beckton	7,000,000
Beckton	3,500,000
Beckton	7,000,000
Beckton	7,000,000
Beckton	5,250,000
Beckton	4,500,000
Beckton	3,000,000
Beckton	1,500,000
Bow Common	1,000,000
Bow Common	1,150,000
Bow Common	150,000
Brentford	1,200,000
Brentford	850,000
Brentford	350,000
Brentford	750,000
Bromley	3,750,000
Bromley	2,250,000
Bromley	1,000,000
Bromley	1,000,000
Bromley	1,000,000
Bromley	1,450,000
Bromley	1,350,000
Fulham	2,500,000
Fulham	1,700,000
Grays	250,000
Grays	400,000
Grays	725,000
Ilford	650,000
Ilford	750,000
Kensal Green	2,250,000
Kensal Green	2,250,000
Kensal Green	2,250,000
Nine Elms	2,750,000
Nine Elms	750,000
Nine Elms	1,870,000
Nine Elms	2,850,000
Shoreditch	900,000
Shoreditch	2,700,000
Shoreditch	2,725,000
Southall	2,000,000
Southall	3,000,000
Staines	600,000
Stratford	1,700,000
Stratford	850,000
Stratford	2,350,000
Stratford	2,350,000
Gelsenkirchen	175,000
Gelsenkirchen	350,000
Geneva	500,000
Geneva	700,000
Geneva	1,270,000
Gennevilliers	10,600,000
Gennevilliers	2,900,000
Girvan	235,000
Glasgow	3,000,000
Glasgow	2,500,000
Glasgow	2,250,000
Glossop	340,000
Gloucester	800,000
Gloucester	1,000,000
Gosport	300,000
Gosport	225,000
Göteborg	300,000
Göteborg	600,000
Graudenz	200,000
Groningen, Holland	500,000
Guest Keen & Piggotts, Ltd.	1,936,000
Guildford	350,000
Guildford	200,000
Guildford	350,000
Guildford	1,100,000
Guildford	150,000
Haarlem	850,000
Hamburg	1,750,000
Hampton Court	500,000
Hampton Court	600,000
Hampton Court	1,100,000
Hanley	800,000
Hanley	800,000
Hartlepool	750,000
Hartlepool	765,000
Hastings	1,250,000
Haywards Heath	470,000
Hebden Bridge	200,000
Heidelberg	200,000
Hereford	525,000
Hertford	197,000
Hertford	244,000
Hessle	150,000
Heywood	500,000
High Wycombe	752,000
Hilversum	850,000
Hinckley	250,000
Holyhead	197,000
Hong Kong	450,000
Hong Kong	450,000
Hornsey	1,000,000
Hornsey	1,000,000
Hornsey	750,000
Hornsey	750,000
Horsham	235,000
Hull	1,500,000
Hull	1,000,000
Hull	1,600,000
Innsbruck	200,000
Ipswich	750,000
Ipswich	1,250,000
Ipswich	600,000
Jersey	564,000
Jersey	564,000
Kampen	350,000
Karlsbad	350,000
Kendal	329,000
Kidsgrove	235,000
Kiel	1,000,000
Kiel	880,000
Kilmarnock	500,000
Kilmarnock	585,000
King's Lynn	197,000
King's Lynn	400,000
Kingston-on-Th.	3,400,000
Kirkintilloch	360,000
Kirkintilloch	827,000

	Cu. Ft. Daily
Kolozvar	100,000
Lancaster	500,000
Langley Mill	500,000
Largs	235,000
Lausanne	250,000
Lausanne	385,000
Lausanne	970,000
Le Mans	420,000
Lea Bridge	350,000
Lea Bridge	350,000
Lea Bridge	400,000
Lea Bridge	1,000,000
Lea Bridge	1,500,000
Lea Bridge	1,530,000
Leamington	600,000
Leamington	325,000
Leatherhead	705,000
Leeds	1,500,000
Leeuwarden	400,000
Leiden	500,000
Leiden	575,000
Leigh	350,000
Lemberg	260,000
Lemberg	500,000
Letchworth	362,000
Letchworth	423,000
Liége	1,000,000
Liége	750,000
Lille	860,000
Lincoln	300,000
Lincoln	883,000
Liverpool	3,500,000
Liverpool	4,500,000
Liverpool	750,000
Liverpool	1,750,000
Liverpool	1,250,000
Liverpool	3,000,000
Liverpool	1,500,000
Liverpool	1,250,000
Liverpool	2,350,000
Liverpool	3,000,000
Long Eaton	430,000
Long Eaton	170,000
Longton	600,000
Louvain	800,000
Lubeck	400,000
Luton	400,000
Maastricht	200,000
Macclesfield	800,000
Magdeburg	1,400,000
Maidenhead	225,000
Maidenhead	225,000
Maidenhead	175,000
Maidenhead	175,000
Maidenhead	200,000
Maidenhead	200,000
Maidstone	500,000
Maidstone	500,000
Malines	500,000
Malines	575,000
Malmö	350,000
Malta	400,000
Manchester	3,500,000
Manchester	3,500,000
Manchester	1,500,000
Mansfield	330,000
Mansfield	493,000
Margate	960,000
Marlborough	100,000
Mayence	700,000
Melbourne	5,000,000
Merthyr Tydfil	300,000
Merthyr Tydfil	1,500,000
Middlesbrough	1,250,000
Middlesbrough	750,000
Middlesbrough	900,000
M/M. Woolston	9,000,000
Minehead	300,000
Monaco	275,000
Monaco	618,000
Monaco	618,000
Monaco	400,000
Complete Gasification.	
Mons	500,000
Montevideo	1,222,000
Morecambe	333,000
Moscow	1,000,000
Munich	1,400,000
Namur	175,000
Narbonne	350,000
Nelson	400,000
Nelson	350,000
Neuss	140,000
Newbury	250,000
Newcastle	2,500,000
Newcastle, N.S.W.	500,000
Newhaven	235,000
Newport Pagnell	188,000
Nice	900,000
Nictheroy	250,000
North Middlesex	200,000
North Middlesex	200,000
North Middlesex	1,000,000
North Middlesex	1,800,000
North Middlesex	800,000
Complete Gasification.	
North Middlesex	900,000
2nd Complete Gasification.	
North Sydney	500,000
North Sydney	500,000
Norwich	1,000,000
Norwich	300,000
Norwich	500,000
Norwich	1,500,000
Nottingham	1,000,000
Nottingham	1,000,000
Nuneaton	125,000
Oberhausen	175,000
Oldbury	500,000
Oldenburg	200,000
Ormskirk	170,000
Ostend	100,000
Ostend	200,000
,, Zandvoorde	700,000
Oxford	4,500,000
Palermo	968,000

	Cu. Ft. Daily
Palermo	850,000
Paris:	
Clichy	4,000,000
Ivry	2,355,000
Landy	6,000,000
Landy	6,000,000
Landy	5,295,000
La Villette	4,000,000
La Villette	2,000,000
St. Mandé	785,000
Paris-Plage	125,000
Pau	550,000
Pavie	194,000
Pavie	212,000
Pembroke	240,000
Perigueux	350,000
Perth, W.A.	125,000
Perth, W.A.	1,000,000
Petone, N.Z.	200,000
Piggott & Co.	1,500,000
Plymouth	2,000,000
Poitiers	350,000
Pontypool	120,000
Port Elizabeth	400,000
Portsmouth	1,000,000
Portsmouth	2,000,000
Portsmouth	800,000
Portsmouth	2,000,000
Posen	450,000
Posen	700,000
Prague	140,000
Preston	1,400,000
Ramsgate	430,000
Reading	1,000,000
Reading	1,000,000
Reading	600,000
Redditch	500,000
Redhill	275,000
Redhill	300,000
Redhill	1,100,000
Reichenberg	200,000
Reichenberg	200,000
Reval	350,000
Rhymney	175,000
Rhymney	250,000
Riddings	258,000
Ripley	120,000
Rochester	2,200,000
Rochester	2,800,000
Romford	300,000
Romford	350,000
Romford	1,200,000
Rotterdam	850,000
Rotterdam	1,500,000
Rotterdam	750,000
Rotterdam	750,000
Rotterdam	600,000
Rotterdam	2,000,000
Rotterdam	500,000
Royston (Yorks.)	250,000
Rugby	1,000,000
Rugby	450,000
Rushden	425,000
Rushden	517,000
Ryde	500,000
Saffron Walden	235,000
St. Albans	700,000
St. Albans	580,000
St. Andrews	210,000
St. Andrews	409,000
St. Gallen	225,000
St. Gallen	225,000
Ste. Ch. Gr. Paroisse	1,320,000
Sté. Kuhlmann	1,270,000
Sté. Kuhlmann	3,200,000
Sté. Kuhlmann	2,150,000
Sté. Tubes Meuse	545,000
San Paulo	700,000
Scarborough	800,000
Scarborough	200,000
Scarborough	350,000
Scarborough	1,300,000
Scarborough	1,350,000
Seaford	200,000
Shanghai	225,000
Shanghai	225,000
Shanghai	1,600,000
Shanklin	259,000
Shanklin	400,000
Sheerness	200,000
Sheerness	180,000
Sheerness	200,000
Sheerness	220,000
Sheffield	1,530,000
Sheffield	3,000,000
,, Steel Prods.	3,000,000
Shirebrook	500,000
Shrewsbury	300,000
Shrewsbury	170,000
Sidmouth	225,000
Singapore	600,000
Sittingbourne	259,000
Southampton	800,000
Southampton	500,000
Southampton	600,000
Southampton	100,000
Southampton	1,000,000
Southampton	1,450,000
Southend	1,250,000
Southend	900,000
Southend	900,000
Southend	600,000
Southgate	400,000
Southgate	500,000
Southgate	800,000
Southgate	500,000
Southport	750,000
Southport	900,000
Southport	900,000
Southport	450,000
South Shields	650,000
South Shields	1,250,000
Stafford	500,000
Stettin	980,000
Stirling	400,000
Stirling	970,000
Stockholm	1,500,000
Stockholm	1,750,000
Stockport	600,000
Stockport	600,000

	Cu. Ft. Daily
Stockport	400,000
Stockport	400,000
Stockton	500,000
Stockton	250,000
Stourbridge	500,000
Stourbridge	500,000
Sunderland	2,250,000
Sunderland	300,000
Sutton	1,200,000
Sutton	1,625,000
Swanage	300,000
Swansea	750,000
Swansea	1,000,000
Swansea	450,000
Swansea	1,250,000
Swansea	2,000,000
Swindon	300,000
Swindon	450,000
Swindon	400,000
Sydney	1,000,000
Sydney	1,000,000
Sydney	1,000,000
Sydney	1,000,000
Sydney	8,250,000
Taunton	225,000
Taunton	350,000
Tawe Valley	275,000
Teignmouth	200,000
The Hague	1,000,000
The Hague	500,000
The Hague	1,750,000
The Hague	1,500,000
The Hague	775,000
The Hague	1,500,000
The Hague	2,930,000
Tilburg	400,000
Tirlemont	120,000
Tokyo	2,000,000
Torquay	350,000
Torquay	350,000
Torquay	320,000
Tottenham	750,000
Tottenham	750,000
Tottenham	350,000
Tottenham	1,000,000
Tottenham	1,000,000
Tottenham	1,250,000
Tottenham	2,500,000
Tottenham	1,000,000
Tottenham	500,000
Tottenham	1,000,000
Toulouse	1,800,000
Toulouse Natl. Wks.	2,400,000
Toulouse Natl. Wks.	6,200,000
Tournai	700,000
Tours	550,000
Trowbridge	250,000
Trowbridge	150,000
Tunbridge Wells	1,000,000
Tunbridge Wells	1,000,000
Tunis	175,000
Tynemouth	1,100,000
Tynemouth	1,100,000
Ulm	400,000
Union Chim.-Belge	1,977,000
Utrecht	1,000,000
Utrecht	1,000,000
Uxbridge	752,000
Uxbridge	1,000,000
Vancouver	3,800,000
Verviers	1,000,000
Vevey, Switz.	650,000
Victoria, B.C.	500,000
Vienna	3,500,000
Vienna	2,500,000
Walsall	750,000
Walsall	375,000
Waltham	400,000
Waltham	140,000
Walton-on-Thames	970,000
Wandsbek	1,225,000
Wandsworth	1,800,000
Wandsworth	4,230,000
Wanganui, N.Z.	376,000
Ware	150,000
Ware	282,000
Warwick	125,000
Wasmuel	500,000
Watford	300,000
Watford	350,000
Watford	400,000
Watford	1,250,000
Wath	430,000
Weimar	100,000
Wellingborough	525,000
Wellingborough	525,000
Wellingborough	350,000
Wellington, N.Z.	350,000
Wellington	300,000
West Bromwich	550,000
Westgate	250,000
Weston-Mare	350,000
Weston-Mare	350,000
Weston-Mare	150,000
Weston-Mare	150,000
Weston-Mare	500,000
Wexford	100,000
Weymouth	400,000
Weymouth	100,000
Weymouth	658,000
Whitstable	423,000
Widnes	500,000
Wiesbaden	850,000
Wigston	250,000
Winchester	225,000
Winchester	125,000
Winchester	410,000
Winchester	325,000
Woking	400,000
Wolverhampton	1,500,000
Wolverhampton	1,000,000
Wolverhampton	250,000
Wolverhampton	400,000
Worthing	525,000
Yarmouth	500,000
Yarmouth	125,000
Yeovil	340,000
Zwolle	200,000
Zwolle	200,000
Zwolle	700,000

910 *Sets of Humphreys-Glasgow Plant have been (and are being) installed with a capacity of over* **773,000,000** *cubic ft. of Water-Gas per diem. Including the work of their American Colleagues,* **2004** *Sets have been constructed with a total* **DAILY** *capacity of* **2,101,000,000** *cubic feet.*

HUMGLAS HOUSE, CARLISLE PLACE (Victoria), LONDON, S.W. 1.

W-D

SERVICE & DEVELOPMENT

Our Best Advertising Mediums

The
WOODALL-DUCKHAM COMPANY
ALLINGTON HOUSE, 136 VICTORIA ST. LONDON, S.W.1.

The WOODALL-DUCKHAM VERTICAL RETORT & OVEN CONSTRUCTION CO (1920) LTD

SATISFACTORY WORKING.

The new bench was set to work in June of last year, and has been working at full pressure since October; and throughout the whole period so satisfactorily has it worked that it has been a pleasure to be associated with it.

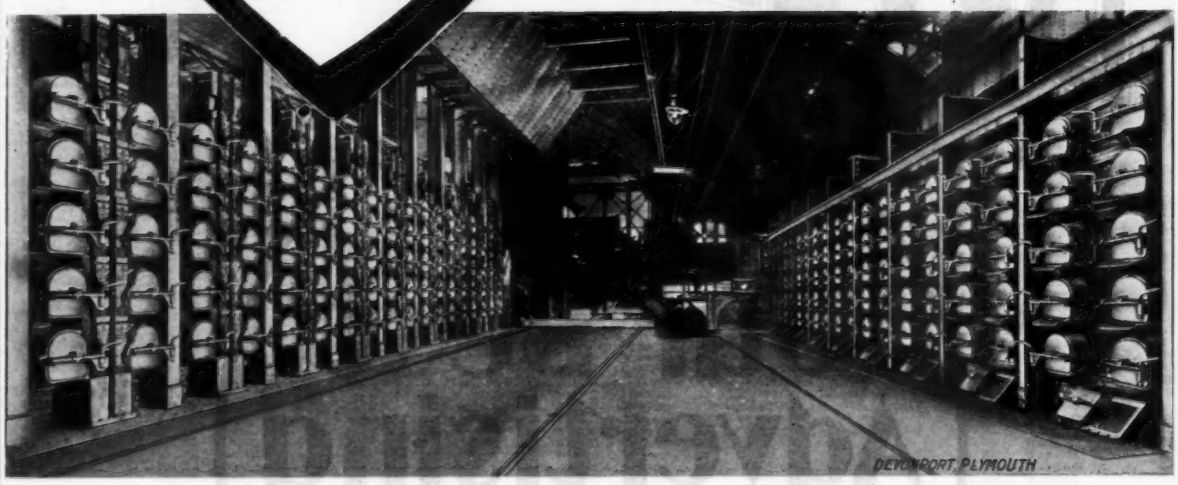
Figures are fallacious, but the following results are taken from our every-day working. We produce a coal gas of from 525 to 550 B.Th.U., and blend with water gas; each working bed regularly maintains a yield of over 200,000 c.ft. per day, and about 70 therms per ton of coal carbonized. The fuel consumption is very satisfactory, and is less than 10 lbs. per 100 lbs coal carbonized. During the winter we have had all working, but none of the old benches. The mar

such that, with slightly greater heats, I am seriously ing, another winter, of adopting 10-hour ch 12-hour charges, when I fully anticipate will rise some 20 p.c. to 25 p.c., carbonized will be reduced so bined with putting off more than pay fo

[This installation of Dempster zontal retorts at Devonport— ster & Sons, Ltd., of El article in the "Jo the official ur

GONE IS THE PRACTICE OF 100 YEARS
MAIN-ARCH GIVES WAY TO THE FLAT BENCH COVER

DEMPSTER-
-TOOGOOD
MODERNIZED
HORIZONTALS



THE OLD GIVES PLACE TO THE NEW

STOPPED ASCENSION-PIPES | MAKE WAY FOR | DESCENSION (SCRUBBER) OFFTAKE PIPES

ROBERT DEMPSTER & SONS LTD.

Wire: "DEMPSTER" ELLAND ELLAND. 'Phone: ELLAND 261.

ESTD. 1855

The Cosie Fire in a modern setting.

MODERN Homes demand Modern Appliances. The Cosie Fire, which we illustrate above, is designed to fit an existing Coal Grate. Its specially constructed Fuel ensures adequate heat distribution, while the several types of Fender available give it a wide range of adaptability. Dependable, economical and distinctive in appearance, Parkinson Gas Fires appeal to every user.

PARKINSON COSIE FIRES

For Catalogue describing these fires, write:—

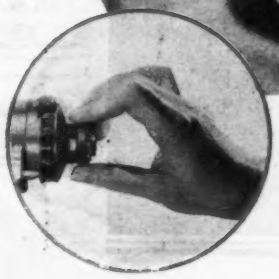
THE PARKINSON STOVE CO., LIMITED

STECHFORD — BIRMINGHAM

London Showroom:
8 & 10, Grosvenor Gardens,
Victoria, S.W. 1.

And at Manchester.
Glasgow, Belfast, Dublin,
and Wellington, N.Z.

THE PARKINSON STOVE CO. (AUSTRALIA) LIMITED
Melbourne, Sydney, and Perth, W.A.



One Hundred per cent. THERMOSTAT USEFULNESS!

Gas has ALL the advantages for domestic use particularly for cooking. Do your Consumers this? Do they know that they have a choi more than fifty widely-varied dinner menus, ea which is appetising and complete and can be per cooked—joint, vegetables and sweets—in the together, *entirely without attention*, and by the v novice? This is what the "New World" Cooker Its ADDITIONAL low-temperature zone at the bo of the oven is specially designed, and the door deep so that milk puddings, custards, &c., can be cook perfection whilst roasting and other high-temper work is being done above.

This is 100% service with the thermostat. Simulta "whole-meal" cooking is the logical developme oven-heat control. It rounds-off the story o advantages of gas cooking, and gives the Public a that is unobtainable with any other fuel.

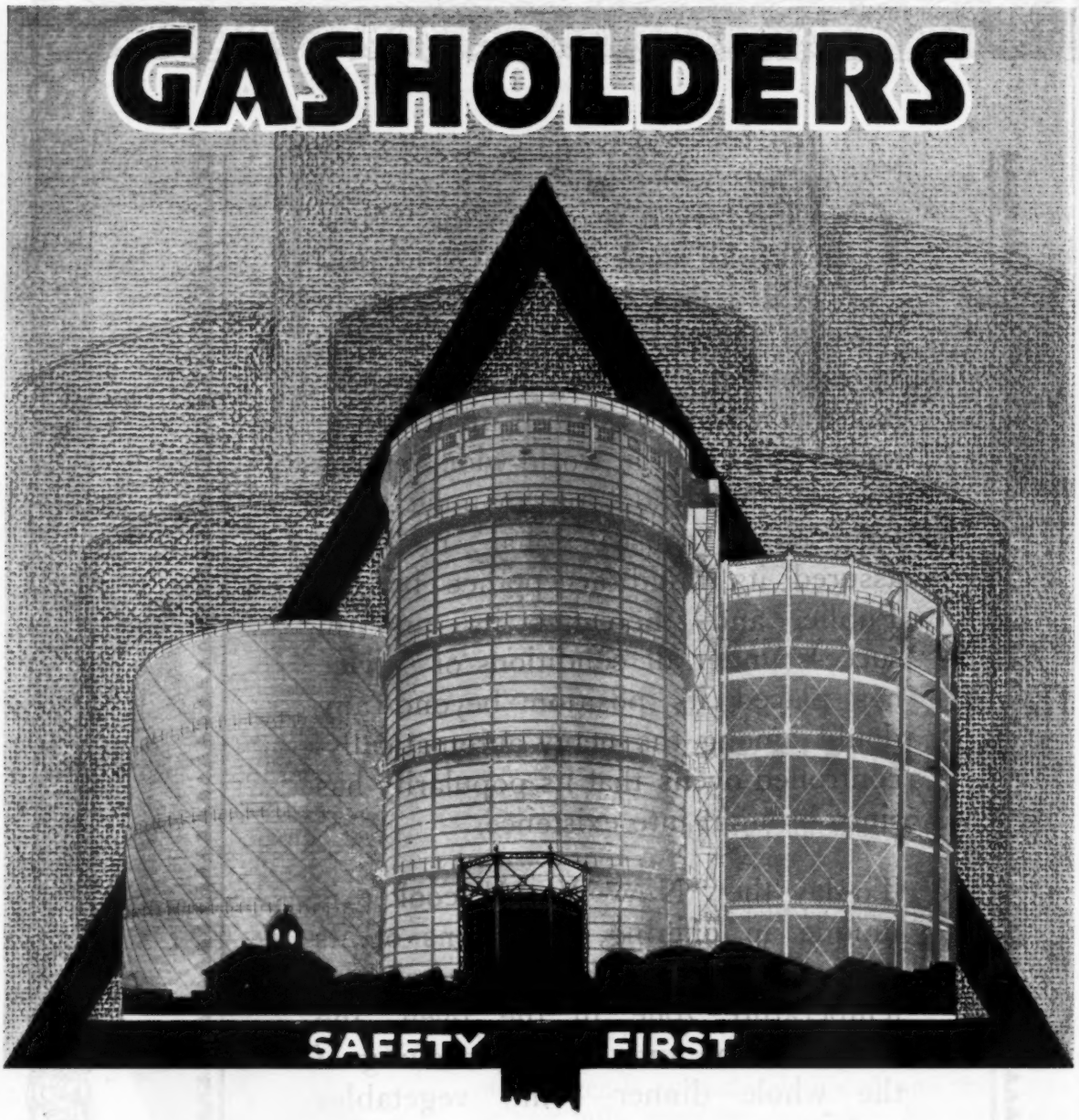
Its success is permanently assured and streng still further the ability of gas to defeat all compe in the field of domestic cooking.

OVER seven years ago the "New World" cooker, exclusively, provided the public with the timely boon of automatic oven-heat control, by means of the "Regulo." The exhaustive nature of the tests made before its release, and the world-wide reputation of the Radiation manufacturers for sound constructional methods, assured its rapid acceptance by the Public, and thereafter its uniform success under all conditions of service has placed its position beyond any doubt among the many automatically-controlled ovens that its popularity has since brought into existence.

To-day the "New World" cooker is unique in offering, by means of its exclusive feature of an additional low-temperature zone in the oven, the means for the simultaneous cooking of the whole dinner—joint, vegetables and sweets—at one operation, without need to open the oven door throughout the cooking period.

Radiation
LIMITED

GASHOLDERS



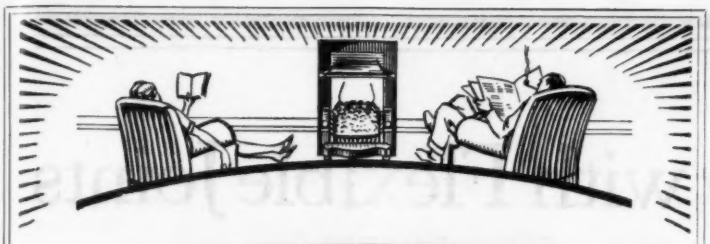
Better send the order to

NEWTON CHAMBERS THORNCLIFFE

ESTD. 1793

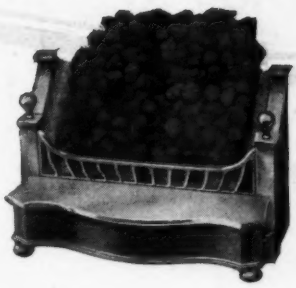
EXPERIENCE EFFICIENCY

THORNCLIFFE *near* **SHEFFIELD**



CINDERELLA

The popular Inset Gas-Fire that is simple to instal and looks like a glowing coke-fire



THE CINDERELLA Fire provides the simplest means of adapting Gas to an existing coal-grate without interfering in any way with the appearance of the original. It is easily fitted, without any building-in, by removing the front bars of the coal-grate, placing the CINDERELLA in position, and connecting it to the gas supply.

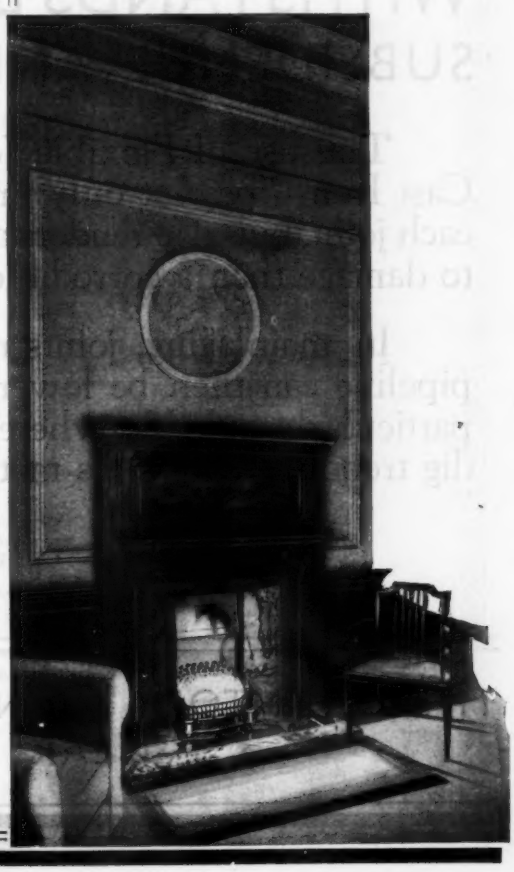
There is a range of 5 sizes, from 7 to 11 radiants, fitting fires from 10¼ ins. to 16 ins. wide between the bricks of the coal grate, with duplex burners for the larger sizes. There is a choice of finishes in Black, Armour Bright, Electro Bronze, Nickelled, and Oxidised Silver.

MAIN

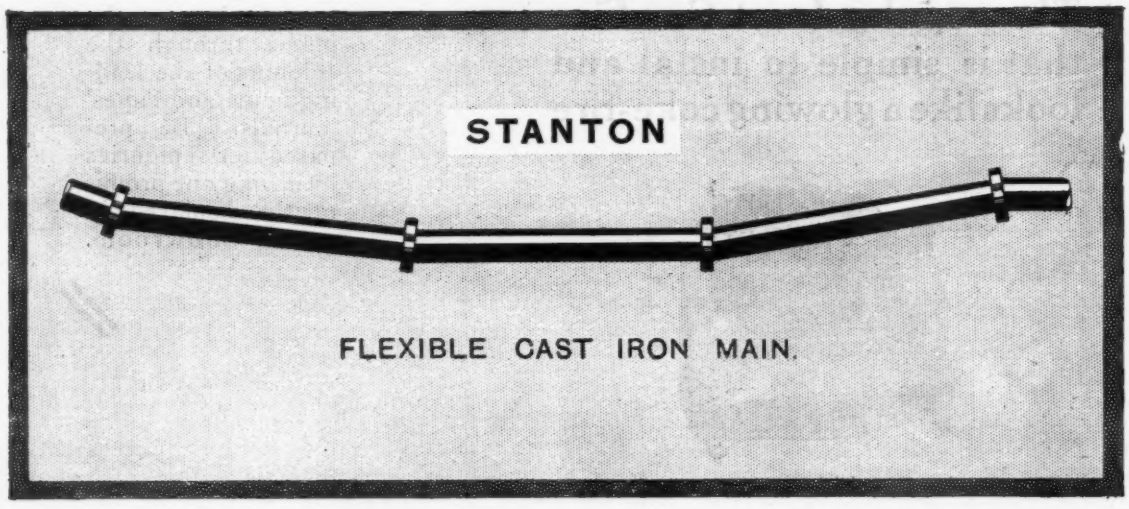
R. & A. MAIN, LIMITED
LONDON AND FALKIRK

London Office and Showrooms, 48, Grosvenor Gardens, S.W. 1.
Glasgow Office and Showrooms, 82, Gordon Street.

The
CINDERELLA
Inset Gas-Fire
is being Advertised extensively to the public through the columns of the leading home and ladies' journals. Be prepared for enquiries by having one prominently displayed in your Showroom.



Cast Iron Pipe with Flexible Joints



WITHSTANDS EFFECTS OF GROUND SUBSIDENCE AND TRAFFIC VIBRATION

The use of Flexible Joints in mains composed of Stanton Cast Iron Pipe, not only provides Flexibility and Expansion at each joint, but also renders a *durable* Cast Iron main less subject to damage than a corrodible Steel Main.

In mainlaying, joints may be made above ground and the pipeline can then be lowered into its trench. This method is particularly suitable where mechanical excavators are used to dig trenches, and helps materially to reduce labour costs.

THE STANTON IRONWORKS COMPANY LIMITED
NEAR NOTTINGHAM

1931

A BRIGHTER AND MORE PROSPEROUS NEW YEAR FOR ALL OUR FRIENDS IN THE GAS INDUSTRY AT HOME & OVERSEAS

We wish to record our appreciation of the support accorded us during the past year, and to indicate our desire and ability to co-operate with them in their activities during the present year.

ALEXANDER WRIGHT & Co LTD
1. WESTMINSTER PALACE GARDENS, VICTORIA STREET.
WESTMINSTER. S.W.1
Telephone: VICTORIA 1207.
Telegrams: PRECISION, SOWEST, LONDON

BRADDOCK'S

UNIVERSAL PREPAYMENT METERS

STRONG & RELIABLE

MADE IN

"Lights," "Standard," and "High Capacity" Sizes

FITTED WITH PATENT

TWO-COIN Mechanism if desired.

J. & J. BRADDOCK

(:: BRANCH OF :: METERS LIMITED) *Globe Meter Works, OLDHAM*

Telegrams—"Braddock, Oldham" Telephone No. 815

and 45 & 47, WESTMINSTER BRIDGE ROAD, LONDON, S.E.1

Telegrams—"Metrique, Lamb, London" Telephone No. 2412 Hop

Index glasses are now ¼-inch plate glass, so the index-door is not necessary.

SIX PURIFIERS, EACH 50 FT. × 30 FT. × 8 FT., ERECTED AT STOKE-ON-TRENT.

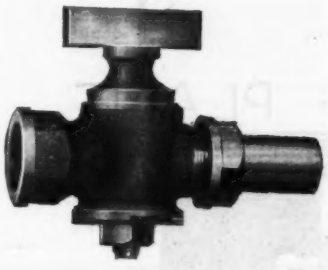
COMPLETE PURIFIER INSTALLATIONS.

C. & W. WALKER, LTD. DONNINGTON, NR. WELLINGTON—SHROPS.

LONDON OFFICE: 70, VICTORIA STREET, WESTMINSTER, S.W. 1.

SAWER & PURVES

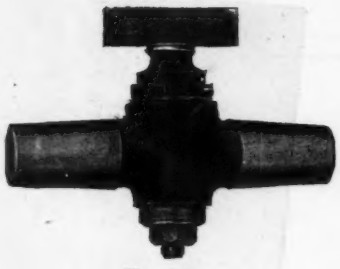
(BRANCH OF METERS LTD.)



No. 119

FOR

MAIN TAPS



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MILES PLATTING

MANCHESTER and NOTTINGHAM

Telephone: 2289 Collyhurst

RADFORD ROAD

Telephone: 75202

GUIDE FRAMED.

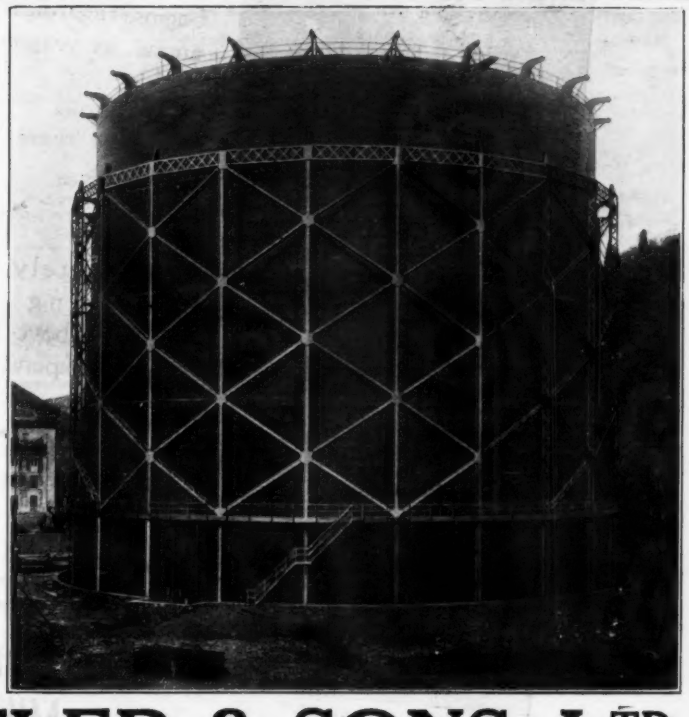
GAS

HORTONSPHERE.

HOLDER

DRY - KLONNE.

SPIRAL.



SAML. CUTLER & SONS, LTD.

39, VICTORIA STREET, WESTMINSTER.
VICTORIA **0321** and **8492**
RETORTUS, SOWEST, LONDON

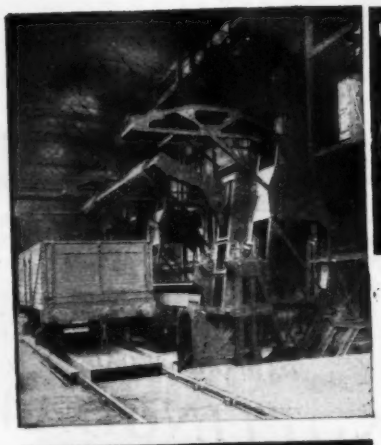
LONDON

TELEPHONES:
TELEGRAMS:

PROVIDENCE IRON WORKS, MILLWALL.
EAST **1734** and **1735**
CUTLER, MILLWALL, LONDON.

WEST

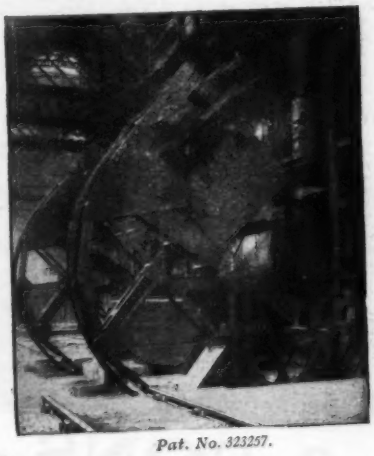
MECHANICAL HANDLING PLANT



The WEST side action wagon tippler

Railway siding unobstructed. The tippler allows full clearance for a main line locomotive passing over the track.

Clamping is effected before the tipping action begins, regardless of variations in wagon heights.



Completely self-emptying into hopper above ground. Saves expensive pits.

Pat. No. 323257.

THE WEST LIP-BUCKET CONVEYOR

BELT AND PUSHPLATE CONVEYORS

FIXED-BUCKET ELEVATORS

COAL BREAKERS

ROTARY AND CASCADE COKE SCREENS

CRANE AND TELPHERAGE PLANTS

AUTOMATIC SKIP-FILLERS

Etc., Etc.

WEST'S

Gas Improvement Co Ltd

ALBION IRONWORKS
MILES PLATTING
MANCHESTER

Telephone: COLLYHURST 2961.
Tel. Add.: "STOKER, MANCHESTER."

London Office:
REGENT HOUSE,
KINGSWAY, W.C. 2.
Telephone: HOLBORN 4108.
Tel. Add.: "IMVERTRET, WESTCENT, LONDON."

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FIRST POST ON MONDAY is the latest for receipt of alterations and stops of standing advertisements.

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WALTER KING, LTD., 11, Bolt Court, Fleet Street, London, E.C. 4.
Telephone: Central 2236-7 (2 lines). Telegrams: "GASKING, FLEET LONDON."

Gas Purification & Chemical Company, Limited

— ESTABLISHED 1873 —

PALMERSTON HOUSE, 34, OLD BROAD STREET, LONDON, E.C.2

Gas Purification Contractors

WILL SUPPLY

Oxide of Iron

on Sale Outright
or on Loan Contract

AND PURCHASE

Spent Oxide

Per Contra or Separately.
London or Provinces
Samples Tested Free

Telegrams: "Purification, Stock, London."
Telephone: London Wall 9144.

GAS WORKS STEAM PLANT.

We can meet your requirements for BOILERS, RECEIVERS, TANKS, WASHER TUBES, SIZING SCREENS, PLATE WORK, BOILER SETTINGS, CHIMNEYS (brick and steel).

INQUIRIES INVITED.

H. & T. DANKS (NETHERTON) Ltd., NETHERTON, DUDLEY.

(See page advert., Dec. 3, Centre p. XV.)

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SPECIALLY prepared for the manufacture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD., with which is amalgamated WM. PEARCE & SONS, LTD., Walsingham House, Seething Lane, LONDON, E.C.3.

Works—SILVERTOWN.

Telegrams—"HYDROCHLORIC, FEN LONDON."
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THOMAS DUXBURY AND CO.

16, DEANSGATE, MANCHESTER. PALACE CHAMBERS, WESTMINSTER, S.W.1.

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GAS PURIFYING MATERIAL.

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J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.1.

WET AND DRY GAS METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.

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Telephones: 815 Oldham, and 2412 Hop, London.

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CHARTERED PATENT AGENTS AND TRADE MARK AGENTS,

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THE BRITISH GAS PURIFYING MATERIALS CO., LTD.,

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Telegrams: "BRIPURIMAT, LEICESTER." Telephone: LEICESTER 5096.

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NATURAL BRITISH PURIFYING MATERIAL,
NATURAL HYDRATED OXIDE OF IRON,
FIRST QUALITY DUTCH BOG ORE,
BEST QUALITY BELGIAN BOG ORE,
"PREPARED" AND "UNPREPARED" ARTIFICIAL OXIDES.

SPENT OXIDE PURCHASED.

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Telegrams: "BRIPURIMAT AVE, LONDON." Telephone: BISHOPSGATE 8656.

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FOR Motor Lorries and Railway Traffic can be seen erected at our Works READY FOR DELIVERY. Inspection by your Engineer invited and a test by your Local Inspector of Weights and Measures before delivery. Every machine a High-Class Engineering Product and fully guaranteed.

CHARLES ROSS, LIMITED,
SHEFFIELD.

APPOINTMENTS, &c., VACANT.

THE Isle of Thanet Gas Light and Coke Company require the Services of a TECHNICAL ASSISTANT to the Works Superintendent in the General Works' Control and Technical Supervision of Gas-Making Plant (including W.D. Verticals and C.W.G.), with machinery and all appurtenances, at a commencing Salary of £175 per Annum, with yearly increments of £25 up to £250 maximum.

Applicants must hold at least the Ordinary Grade Certificate of the Institution of Gas Engineers in "Gas Engineering." Applications, stating Age and Experience, with *copies* of Three recent Testimonials, to be received not later than the 19th of January, 1931.

J. M. CAMPBELL,
Engineer and General Manager.

Gas-Works,
Addington Street,
Margate,
Dec. 23, 1930.

OXIDE OF IRON.

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BALE & CHURCH, LTD.,

33, ST. MARY AT HILL, LONDON, E.C.3.
Phone: Royal 1484.

"TORTO" FIRE CEMENT.

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"KLEENOFF," THE COOKER CLEANSER.

Tins for Sale to Consumers.
In Bulk for Works Use.
(See "Gas Salesman.")

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TEL.: OXIDE, MANCHESTER. ESTABLISHED 1890.

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FRESH OXIDE {ON SALE / OR LOAN.

BRITISH MAKE.
IMMEDIATE DELIVERY.
NO EXCESS MOISTURE.
IMMEDIATE ACTIVITY.
MINIMUM BACK PRESSURE.
MINIMUM EXPOSURES.
MINIMUM LABOUR.

SPENT OXIDE PURCHASED
ON SULPHUR CONTENT.
ON **BLUE** CONTENT.

SPECIALISTS IN PURIFICATION.

GAS PURIFIED IN 1929
OVER 46,000 MILLIONS.

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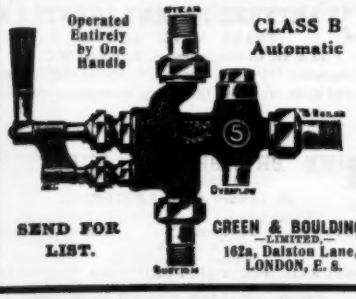

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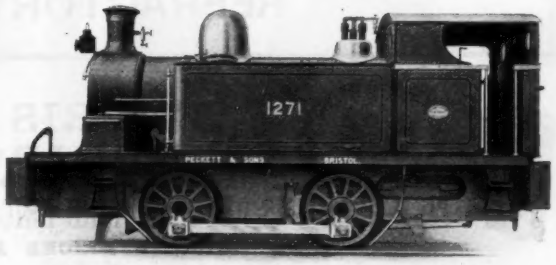

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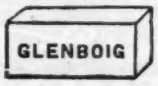
TRADE 

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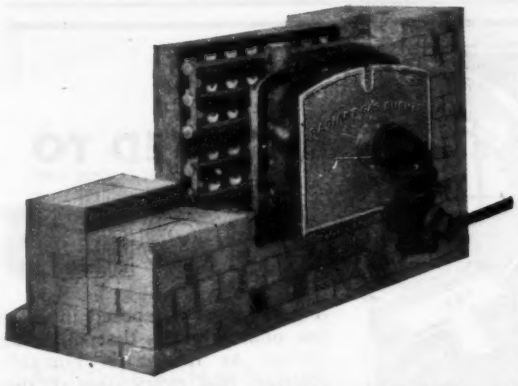

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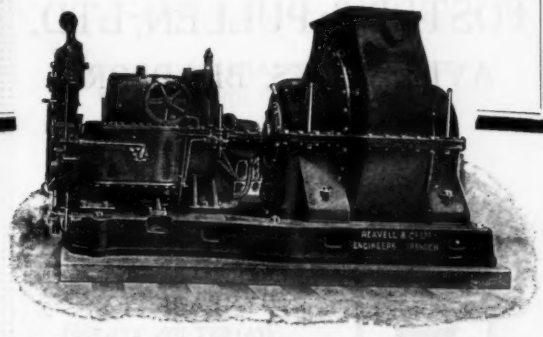

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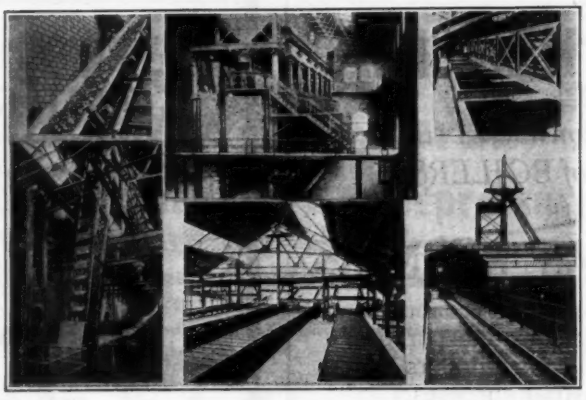

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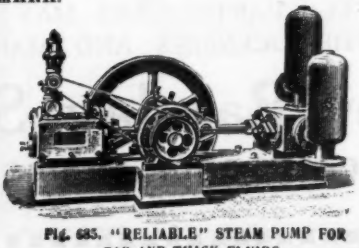

Fig. 685. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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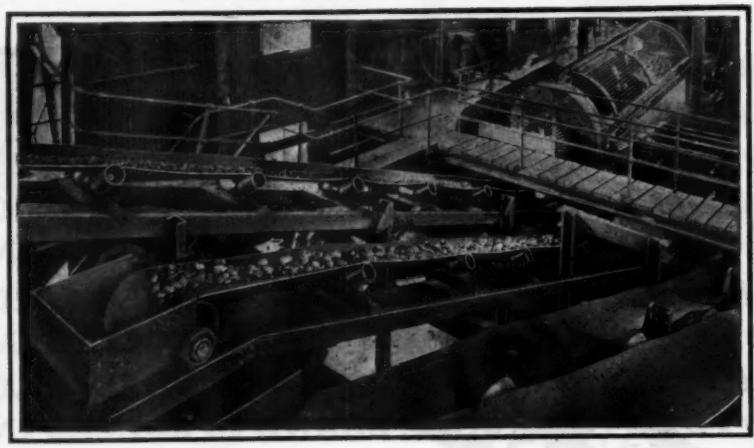

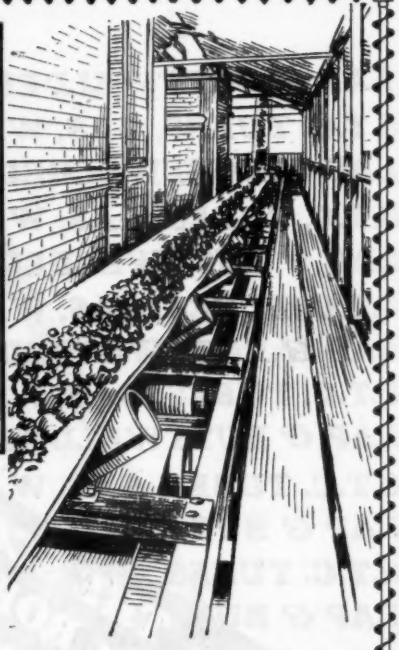

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